THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1739.] LONDON, SEPTEMBER 8, 1896. [48TH YEAR. PRICE 6d.

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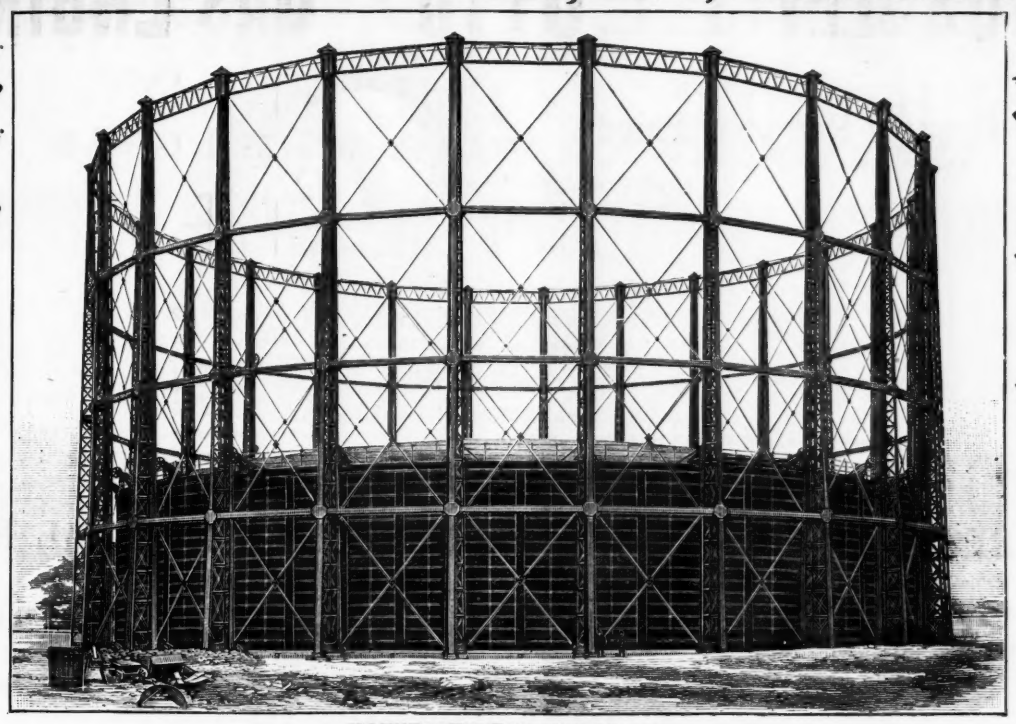

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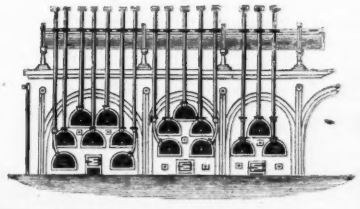

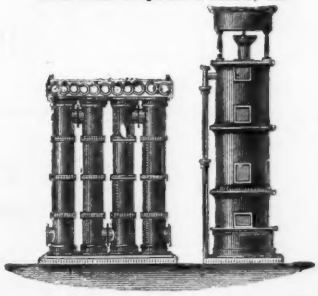

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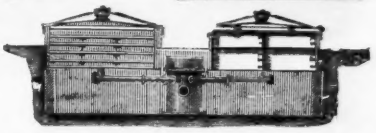

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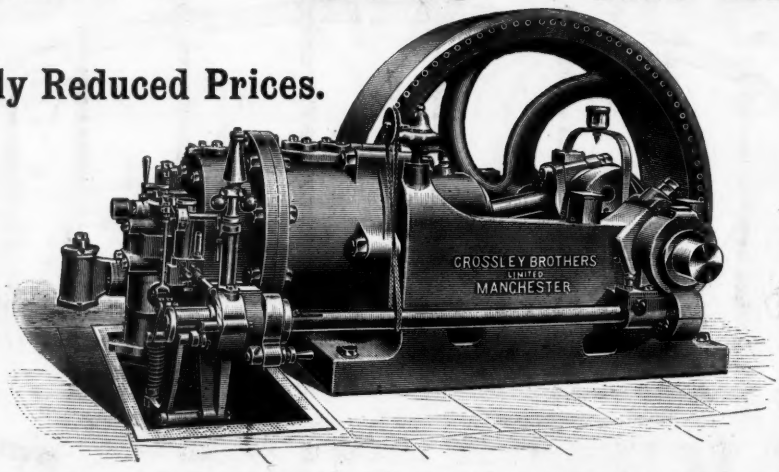

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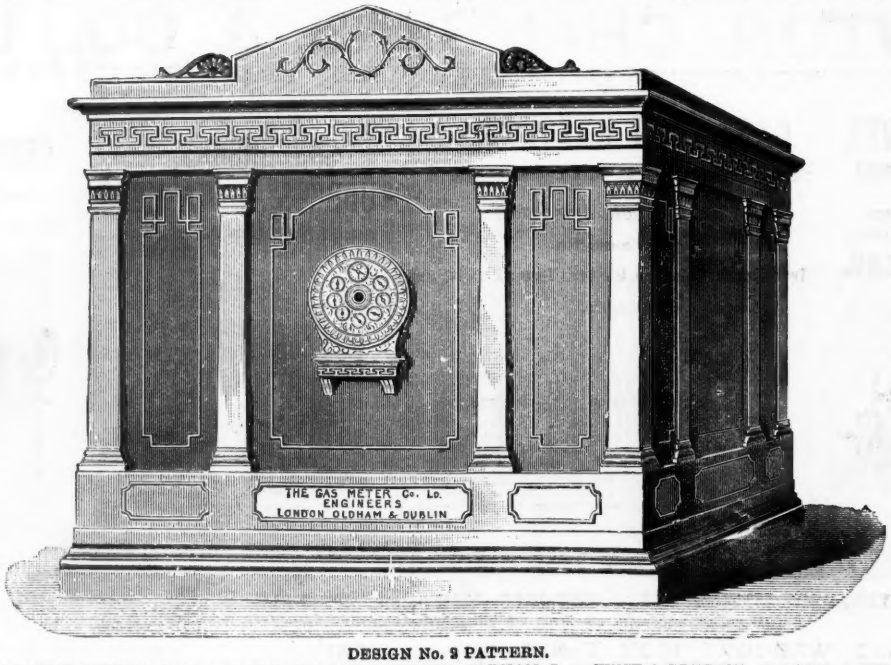

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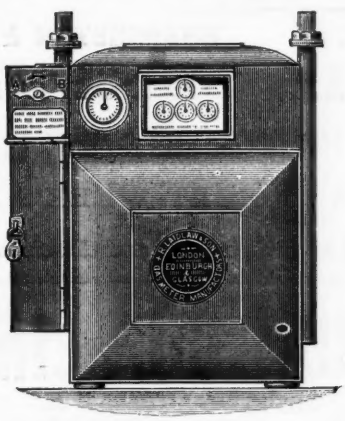

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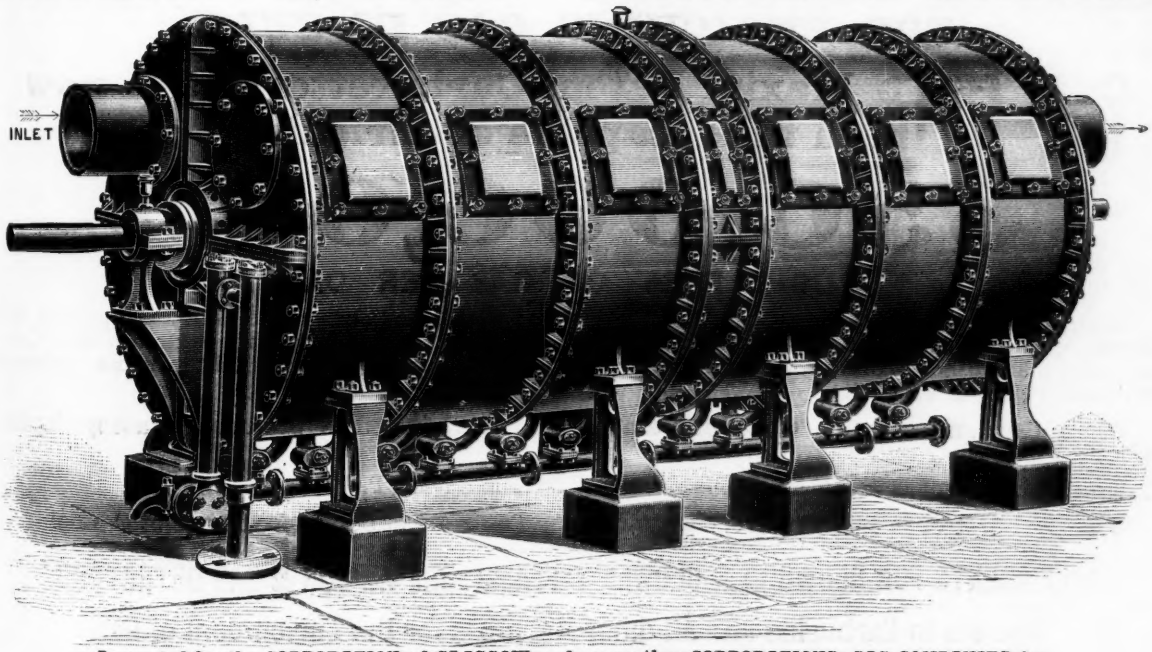

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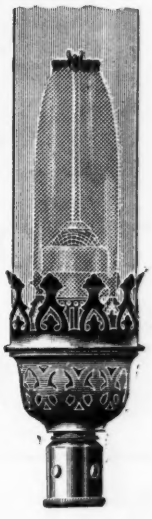

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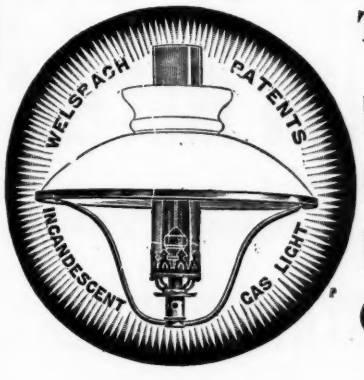

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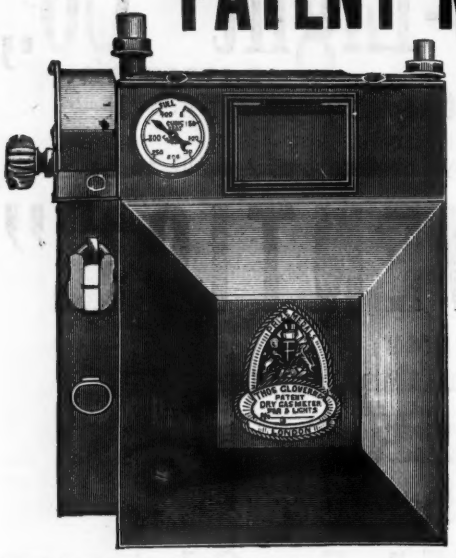

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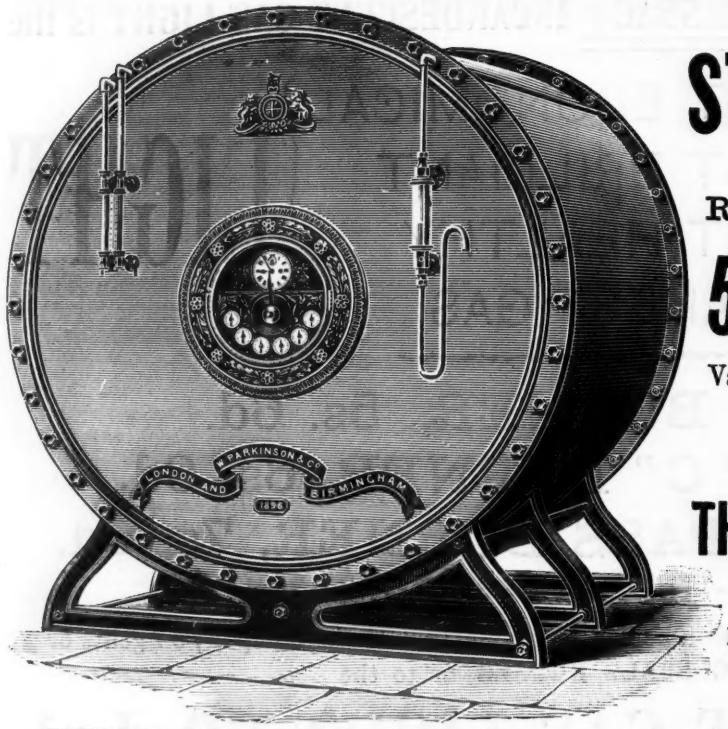

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EDITORIAL NOTES.

The Board of Trade Report on the Gas Orders of the Year.

THE annual report by the Board of Trade on their proceedings under the Gas and Water Works Facilities Act, 1870, was reproduced in our columns last week, and is deserving of notice here as constituting the most convenient record of the fate of the draft Provisional Orders of which we published the particulars at the commencement of the session. There were in all fourteen of these applications, six relating to gas, seven to water, and one to a combined gas and water undertaking. The capital proposed to be authorized by these Orders amounted to £205,800 by shares, and £88,700 by loan, of which £96,800 of share, and £61,460 of loan capital was required by the gas undertakings. The application of the Maidstone Gas Company was the only one made in respect of a statutory gas undertaking—the Company here desiring to increase their capital by the issue of debenture stock. The remaining five gas applications were for statutory facilities for carrying on existing undertakings. Most of the applications were opposed, and one of them—the Oswestry Order—was eventually, in consequence of opposition, withdrawn by the promoters. But all the others were persevered with, and eventually obtained from the Board of Trade, subject to certain modifications and amendments. In the case of Chester-le-Street and Pelton, the consents of some of the local and highway authorities interested were not obtained; and the Board of Trade were requested to dispense with such consents. A special report is required to be made to Parliament in all such cases; and this was duly done in the present instance—the Order being granted on the report of their Inspector, after a local inquiry. The cause of dissatisfaction here was the price proposed to be charged for gas in the district; and the Inspector (Colonel Yorke, R.E.) took the strong course of recommending the substitution of a standard price of 2s. 9d. per 1000 cubic feet, with the sliding scale, for the proposed maximum price of 5s. per 1000 cubic feet.

The same Inspector had to deal with the Fort William Order, which was opposed by the Burgh Commissioners on the ground of the unsuitability and inadequacy of the gas-works site, besides other reasons. Colonel Yorke reported that, in his opinion, the situation of the works was undesirable, and that the area of the site was inadequate; and he suggested that the Order should be withheld until a more suitable site had been selected. The Board of Trade, however, while appreciating the gravity of these objections, considered that the desirability of placing the gas supply under statutory restrictions was paramount; and they therefore decided to grant the Order subject to an amendment facilitating the transfer of the works to a new site. Another interesting Order was that of the Matlock Bath Gas Company. This was opposed by the District Council, chiefly on the ground that the Council were actually promoting a Bill in Parliament for the acquisition of the undertaking. Nevertheless the Board's Inspector (Colonel Addison, R.E.) reported in favour of granting the Order, subject to modifications and the insertion of a clause providing that if the District Council obtained power for the purchase of the undertaking, the price to be paid should not be increased by reason of the issue of the Provisional Order. The Board of Trade acceded to the Inspector's recommendations, and made the Order, which was included in a Confirmation Bill. But in the meantime the District Council obtained their Bill; and accordingly the Order was dropped. The Settle Gas Order was granted, subject to the insertion of a clause providing for the sale of the undertaking to the District Council, in the event of that body obtaining the necessary power to purchase before Jan. 1, 1898, and calling upon the Company to sell.

From these various pieces of evidence, several hints may be taken to show the bent of the Board of Trade in dealing with draft Provisional Orders. It appears very conspicuously, from the Fort William example, that in the opinion of the Department overriding that of their own Inspector, the grant of statutory powers and responsibilities to a Gas Company is a matter of such capital importance as to warrant the insertion in an Order of the

most stringent conditions rather than allow it to be lost. The same lesson is to be drawn from the case of Chester-le-Street and Pelton. Here the local and highway authorities did not want the Company to have an Order at all; but it was held to be for the public benefit that the gas supply should be in the hands of a Company having statutory powers and statutory obligations. It is to be hoped the lesson will not be lost. In the case of Matlock Bath, the point to be noted is that the Board of Trade were not willing to deny to the promoters the benefits of the Act by reason of the concurrent appeal of the District Council to the higher authority of Parliament. On the whole therefore, it is gratifying to perceive that the Department continues to be alive to the mutual advantages to Gas Companies and the public of those statutory facilities which it so ably and considerately dispenses.

The Price of Gas in the Manchester Out-Townships.

THERE has been a lively controversy in the Manchester City Council respecting a proposal of the Gas Committee to reduce the price of gas in the out-townships by 3d. per 1000 cubic feet, and also to abolish meter-rents. The recommendation was a sort of surprise; nobody outside the Gas Committee having an idea that they could afford to be so just, not to say generous. In moving the adoption of the Committee's recommendation, however, Alderman Gibson said they had come to this conclusion because they thought the reduction "a just and proper one, because they "considered it expedient, and because they knew they could "afford it." The first of these reasons ought not, strictly speaking, to depend on the last; but this is not a perfect world, and we are all accustomed to ask ourselves whether it pays to be good. There can be no real doubt as to the wisdom and the justice of reducing the excessive differential price of 6d. per 1000 cubic feet at present levied on the extra-civic consumers of Manchester gas. Something is needed to develop the use of gas in these regions, which Manchester is compelled to supply; and a reduction of price is the best means that could be adopted to this end. It appeared, however, that the City Council, which voted for the last reduction in the price of gas within the city limits—against the advice of the Gas Committee, and despite the protests of the Chairman of the Committee—was not at all disposed to extend similar relief to the out-townships. Several members expressed a difficulty in understanding why the proposal should have come just now. There was, as usual, a good deal of nonsense talked about what Manchester has done for these townships, and how little they have done for Manchester in return. There is nothing to be gained from such recriminations; and it is rather disappointing to gather from the reports of the debate in the Council that so many members indulged in them, while very few talked the matter over in a business-like way, and purely as a matter of business. One of the few was Alderman Higginbottom, who pointed out truly enough that, if the Gas Committee were not working under an old Act of Parliament, they would be unable to make any distinction at all in the price charged to their customers. These differential prices for gas supplied within or outside a city boundary are, in fact, relics of the dark ages when gas was regarded as a luxury, instead of being used as a necessary of town life. Alderman Mark also talked good sense respecting the proposal. But, in the end, an amendment deferring the reduction in general terms was carried against the Gas Committee by a considerable majority. Alderman Gibson declared the Committee had had great pressure from the out-townships upon the point; and they wanted the Council to take the responsibility in the matter. This has now been done; and the out-townships must wait for fairer treatment until, perhaps, next summer when the annual accounts of the department come up for discussion. It will be quite in order then for Alderman Gibson, if he is in earnest, to renew his proposal, which must be free from all suspicion of ulterior motive. So far as the justice of the reduction goes, as already remarked, there can be no real criticism; but it is easy to sympathize with the feelings of those members of the City Council who object to important acts of policy of this kind being obtruded upon them unexpectedly. There is a time for all things; and the time will come when Manchester will do what is reasonable by the out-townships in the matter of the gas supply.

The Effect of Coin-Freed Gas-Meters on the Coal Trade.

AT the recent annual conference of the National Association of Colliery Managers, held at Wrexham, the President, Major Clayton, of the Brynmally and New Broughton Collieries, North Wales, made some memorable observations on the state of the coal trade generally. He accused the leaders of the Miners' Federation of contributing, by their mistaken policy, towards bringing about the present deplorable state of the coal industry. When the Federation caused the last great suspension of work throughout the Midland and associated districts, the North of England and South Wales, said Major Clayton, "relieved them of a considerable proportion of their trade." This has never been got back; the non-federated districts having, during the past twelve months, been able to work about half a day per week more than the federated districts. The same tale is told by the figures relating to the coal output for the past year, which show that, whereas the total weight of coal produced over the whole country had increased by 1,383,837 tons, the output from the West Lancashire and North Wales fields, which form a very large portion of the federated district, showed a decrease of 917,300 tons. These facts, the speaker thought, should arouse the attention of those who are responsible for the present state of things in the Midland district. Major Clayton went on to remark that "another reason undoubtedly for "the slackness in the coal trade was that the Gas "Companies, through the uncertainty caused by the "action of their men, and with the desire to create "another market for their gas on account of the in-"creased use of electricity in public and private build-"ings, had in many large centres offered to supply and "erect, free of cost, gas-stoves in all buildings within "their district. This he considered one of the most "serious points the coal trade had to fear." There is a peculiar mixture of truth and illusion in this passage. It is curious how quickly chairmen of railway companies, and now colliery proprietors, have begun to make complaints as to the effect of the coin-freed gas-meter system upon their business. It is hardly too much to say that, by all accounts, gentlemen occupying these positions have discovered the resultant of an impulse that the Gas Companies themselves, who initiated it, have as yet scarcely experienced. A very small percentage of the increased gas consumption is all that the firmest believers in the system in question have been able to place to its credit. Yet here is a colliery proprietor and manager who professes to be seriously alarmed at it! After all, however, the gas that is sold in this way comes from coal; and there is little reason to fear that the coal contracts of British Gas Companies will either decrease in importance or be placed out of the country.

The Meeting of the British Association.

THE meeting of the British Association in Liverpool may be trusted to furnish a store of pabulum on which all the scientific and many of the technical periodicals published in the English language will feed with avidity for several weeks to come. We may rely on coming across more or less full abstracts of presidential addresses and sectional papers whenever we take up a copy of such publications until the winter's new work is well advanced. The President of the Association this year is Sir Joseph Lister, who represents a science as far removed as is conceivable from anything that can properly occupy our attention here. We may have something to say concerning a few of the sectional addresses, and the papers; but it is now generally recognized that men do not send new work to the British Association. It is twenty-six years since the Association met in Liverpool, under the presidency of the late Professor Huxley, who stirred the scientific and intellectual world, as was his wont, with his masterly address on a subject of his own creating. Times have changed since then; and men and manners have, to some extent, changed with them. The same old bitternesses remain, and will continue to diversify the progress of the world for as long as it is necessary to look forward in this progress; but they have taken to fresh manifestations. This year Professor J. J. Thomson, of Cambridge, who presides over the Section of Mathematical and Physical Science, will deal with the Röntgen rays and other novelties that have cropped up in this department of science since last meeting. Dr. Ludwig Mond presides over the

Chemistry Section, which will have papers by Dr. Bedson on the Composition of Coal, and will be treated to an exhibition of photographs of explosions of gaseous mixtures by Professor Harold B. Dixon. The Section of Economics and Statistics will have for its President the Right Hon. Leonard Courtney; and several papers that should prove interesting and important will be presented to the section on topics of the day, including such matters as "The Incidence of Rates and the Municipal Control of "Finance." Some effort has been made by the Secretaries, by grouping the papers, to secure good discussions. The Section of Mechanical Science promises several papers that should be of interest to our readers, besides the address of the President, Professor C. Douglas Fox.

WATER AND SANITARY AFFAIRS.

In discussing last week, the question of a water supply by meter, recommended by "The Times," and approved by Mr. George Livesey, as an effective remedy against waste, we by no means exaggerated the difficulties which stand in the way of such a system. In addition to the objections we then urged, this one stands prominent—that, in the case of many thousands of the small houses in East London, the meter-rent alone would amount to more than the present water-rate. The case is complicated by the circumstance that, in a house with several separate tenancies, there must be as many meters. The fact that the income of the East London Company only averages a penny a ton, also requires consideration. If the consumer were to receive his ton all at once, he might think it rather too much of a good thing. As he would have it only by degrees, he would perhaps be puzzled to know when to put in his next penny. In this instance, so in others, there is a marked distinction between the supply of water and that of gas. The difference in price per cubic foot is not much as between the two kinds of supply, though if measured in this way water is somewhat the cheaper. But the difference is in the demand; something under 30 cubic feet of gas being more frequently wanted than 36 cubic feet of water or rather less, as representing a ton. The cheapness, of water, as supplied to the Metropolis, is scarcely apprehended; and the net water-rate of the East London Company per 1000 gallons is lower than that of any other Company, or barely half the amount realized by the New River Company, and 32 per cent. below the average of the eight Companies. Compared with the other seven, the superior cheapness of the supply given by the East London Company would, of course, be still greater. But taking the water supply all round, the charge of less than 7d. per 1000 gallons, or nearly 4½ tons, appears in striking contrast to any other mode of supply. The final profit descends to an average somewhat less than half the charge to the consumer; and in the case of the Southwark and Vauxhall Company, it comes out at little more than 1d. for the 4½ tons.

The "Daily Chronicle" has taunted the East London Company for not looking ten years ahead. The charge thus promulgated has no foundation in fact; but we might ask the "Chronicle" to look back merely for the space of three and a half years, so as to revive the recollection of what that infallible organ had to say when the Bill of the East London Company was rejected in 1893. The event was proclaimed as "A Triumph for London," and "Progress at Last." Our contemporary excels in headlines, as we observed last week. The proposal to raise "a round half million of money" for the extension of the Company's works was denounced at the time as a scheme on the part of the Directors "to bloat "the purchase price" of their undertaking. This design was pronounced "unquestionable;" and it was argued, on grounds entirely wrong, that the Company had "admitted they had enough water for 40 years." That this simply had reference to the resources, and not to the works, was persistently and perversely denied. But the Bill was defeated, despite an earnest appeal in its support from Mr. Mellor, the then Chairman of Committees of the House of Commons. How the defeat was accomplished we find boldly set forth by the "Chronicle." The County Council is shown to have strained every nerve to overthrow the measure. Mr. Stuart and Mr. Benn exercised their eloquence for the purpose. Mr. Burns, "carrying out the valuable *entente* "between Celtic and Saxon democracy, whipped up Irish-"men and Welshmen into the lobby;" and the Bill was lost by 24 votes. The "Chronicle" said—the date of the jubilation being March 18, 1893: "The ostensible object "of the Bill was that London was threatened with a water "famine." The idea was ridiculed; and London was congratulated on the fact that the result of the division in the House of Commons was "a decisive set-back to the "water monopolists." The "set-back" proved calamitous to East London, as predicted. A year was lost, and the "famine" came. Now the Directors are told they ought to have brought forward their scheme—or a bigger one—ten years ago. It might have been well had they done so; for there was no County Council then, and Mr. Burns had not yet become a power in the State. But, when the scheme was finally launched, it had grown the more urgent, and not even the delay of a year could take place without peril. Mainly with regard to last year, and wholly with regard to this year, the blame of the "water famine"—to use the "Chronicle" phrase—rests with the County Council as it existed in 1893. If the blame is to be shared elsewhere, it must be chiefly with the "Chronicle," which all along has misrepresented the question with an audacity unparalleled in the history of London journalism. Had this versatile organ remained quiet when the painful results of its mistaken policy had developed themselves, silence might have been interpreted as an acknowledgment of its previous error. But the "Chronicle" has sought to hide its discomfiture, under cover of an onslaught on the Company for not doing that which would have been done, had not the "Chronicle," the County Council, the Irishmen, and the Welshmen prevented it.

Thanks to the showers which have recently prevailed, the earth is getting saturated; and the streams have begun to flow. An increased supply of water to the East London district commences with the present week; and perhaps in a little while the "Chronicle" will forget to abuse Mr. Crookenden, who, like the President of the Local Government Board, appears to be held responsible for the rains of heaven. But the question is now beginning to enter on a broader phase. In view of the recent announcement by Mr. Balfour, a discussion has been opened in the columns of "The Times," as to the desirability of coupling the reform of London Government with some mode of settling the Metropolitan Water Question. "A Marylebone Vestryman," writing in "The "Times" last Wednesday, states out of the forty Vestries and District Boards of the Metropolis, many feel they prefer that the ownership of the water supply should remain with the present Companies, under proper and equitable safeguards, rather than be in the control of the County Council, "as they view with the keenest distrust "any further increase of the County Council's powers." The division of London into separate municipalities is recommended; and it is stated that no fewer than eleven important London parishes, possessing together a rateable value of upwards of £12,000,000, have applied to Lord Salisbury and Mr. Chaplin for Charters of Incorporation. How the control of the water supply is to be given to the proposed municipalities is not explained, though it may be thought that a Water Board could be formed by means of representatives from the several corporations. On Friday a letter on the same subject appeared in the leading journal from General C. E. Webber, expressing a conviction that "all the control necessary for the consumers of "water in the Metropolis" could be obtained, without incurring "the enormous outlay" requisite for the acquisition of the undertakings. That any momentous change is necessary for the further control of the water supply is, we consider, a conclusion by no means demonstrated. No Water Board is really required, unless purchase is ultimately intended. Control, if more of it is wanted, can be carried out by the existing authorities, without the introduction of any revolutionary scheme. If the Companies are to see no change until the government of London is reformed, we fancy they will be left where they are for some time to come. But there is a shorter road, if only the powers that be are content to take it. Even the Companies might come forward with a scheme, if they were sure of being able to make an offer "without "prejudice."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 472.)

A VERY quiet week indeed was the last one completed on the Stock Exchange. But if business was at a low ebb owing to the holiday season, yet it was a much happier time than the preceding week had been. The key of the position was Wall Street again; and as the political outlook on the other side of the Atlantic became lighter, the markets on this side took their tone, and lost their depression. Even foreign affairs were thought to be a little less black; and, if it had not been for the disquieting threat of strikes here at home, everything would have been more buoyant. Consols rose smartly; and the gilt-edged class generally were strong. The Money Market fully maintained the advance it made in the preceding week, and closed very firm. Business in Gas was not as quiet as might have been expected; there being a strong demand the whole week for all the good stock that could be obtained. Gaslight "A" was readily taken, and gradually hardened; transactions rising from 316 on the opening to 319 on Friday (which was the best of the week)—the quotation showing a rise of one point. The secured issues were quieter after their recent activity, and did not vary. South Metropolitan was very firm, and edged up to 155, with business done at 154—a price which returns only £3 7s. 6d. per cent. for money. Commercials were quite stagnant for want of business. If only a moderate bit of stock would come into the market, the price would probably move freely. In the Suburban and Provincial department, what little stock was obtainable was readily secured at top prices. The only change was in Tottenham and Edmonton; and this was more a correction than an advance—the price in the preceding week having been put far too low. In the case of many of those issues which but rarely come into the market, the quoted prices must be regarded as nominal and approximate, and subject to variation when business actually offers. The Continental Companies were only moderately active, and unchanged. They may be quoted firm generally; and European especially so. None of the rest made any particular show, except Buenos Ayres, which had a further rise, and has now reached a nice price. Business in the Water Companies was very quiet—in fact, it was perhaps never quieter. Some three or four transactions were the total of the week; and the only move was a rise in Southwark.

The daily operations were: Business in Gas on the opening day was moderate, considering the time of year. Prices in general were good and steady; but quotations were unchanged. Transactions on Tuesday were much more restricted; business falling away very quiet. Prices were about the same; and quotations again closed without any variation. Wednesday was much more active, with a brisk demand. Prices for Gaslight "A" improved as the day progressed. South Metropolitan advanced 1; and Tottenham, 15. There was rather less doing on Thursday; but the firmness evinced the previous day was unimpaired. Tottenham was put up 5 more; and Buenos Ayres rose ¼. The demand for Gaslight "A" proceeded on Friday; and the quotation rose 1. South Metropolitan changed hands at top price. In Water, Southwark ordinary was 2 higher. Saturday was a quiet day; and the only move was a further gain of 1 in South Metropolitan.

ELECTRIC LIGHTING MEMORANDA.

The Electric Light in Australia—The Best Installation in Queensland—The Case of the Borough of Redfern—Absurd Claims.

IN a recent issue of the "Electrician" there appeared a very interesting discussion as to the prospects of electric lighting in Australia, *apropos* of the passing of an Act by the Victorian Legislature relating to electric light undertakings, and also of the publication in the same issue of a report on the subject of such undertakings by an engineering correspondent. An earlier correspondent had informed our contemporary that, in his opinion, there is a great future for electric lighting in Australia, which may or may not be an exact forecast. It is our contemporary's view, however, that, whatever the future may hold in store, Australian electric lighting has "no past, or next to none." Without pausing for more than passing comment on the reappearance in this connection of the wonderful propensity of electricians to talk about what they are coming to in the future, we venture to observe that it is hardly correct to state that Australian electric lighting—or, more properly, Australian electric light speculation, which is perhaps hardly the same thing—has a very instructive, although not a very creditable past. As a matter of fact and of history, almost as soon as the wave of the electric light speculation of the early "eighties" reached our own shores, it passed on to the Antipodes. The first of the Brush impositions had a highly developed Australasian branch, which has only perished a few years. There was, indeed, an excellent *primâ facie* case for the introduction of electric lighting into Australia where, as our contemporary somewhat tardily perceives, "circumstances are such that the cost of fuel is comparatively moderate, and the price of gas extremely immoderate; where the somewhat torrid nature of the weather makes a cool light distinctly welcome; and where, we may add, the latitude is such that the duration of daylight does not vary in so violent a manner as it does at home." All this was as true—we do not include the price of gas in this estimate—in the early part of the last decade as it is to-day; and such considerations were not overlooked by those who engineered, and those less fortunate people who supported, the Australasian electric light ventures of the Brush and other companies of the same class and era. Yet the failure of the speculation in question was so complete that our esteemed electrical contemporary appears to have forgotten that it was contemplated.

Apart altogether from the disaster of the Brush speculation, however, there has been a good deal of sporadic electric lighting enterprise in the chief Australian centres of population. Mr. Henry J. Spencer, writing to the "Electrician," does not give a very good account of most of these ventures that have come under his notice. His exceptions are worthy of some notice. Beginning with Queensland, he admits that the best central electric lighting station in this Colony is that belonging to the Rockhampton Gas Company. Here a low-tension direct-current system is employed for the central portion of the town, with underground distribution; Chamberlain and Hookham meters being used in connection with it. For the suburbs, the high-tension alternating current, with overhead wires, is adopted. It may be gathered from this and other observations on the general subject, that Rockhampton has discovered that the successful conduct of an electric lighting central station demands much the same order of business management that has made gas supply possible under Australian conditions. Australian gas practice, it may be observed, is usually conducted upon the English model. Where the electric light has been introduced into Australian towns upon the hurry-scurry, and slap-dash American method (or want of method), with the glaring arc lamp stuck upon a pole as its type of service, the result has usually been disaster to the adventurers, and disappointment to the public. Even in Brisbane, the Queensland capital, we learn that the pioneers of electric lighting in the city can only boast of having "a small station in Edison Lane, consisting of a 40-horse power horizontal engine"—not a grand show for such a propitiously-named location. Here, however, we are bidden to believe that "the gas interests" have delayed the advent of the electric light in the city streets. After what had previously been stated concerning the excellent service rendered by the Rockhampton Gas Company in this respect, the aspersion upon "the gas interests" seems out of place.

With regard to Sydney, Mr. Spencer is able to speak with the authority due to his having been in charge of the Municipal electric lighting station of the borough of Redfern—presumably a suburb of Sydney—for the first two years of its operation. We are told that the old gas lighting of the borough cost the public £2000 a year, which may be supposed to be the reason why the Municipality went in for electric lighting. A good deal of detail information is given as to the construction of the central station, even to the dimensions of the chimney shaft; but very little is said as to the working results of the venture, except that the "streets are obviously better lighted than those of surrounding boroughs where gas is used, and at lower cost." One would have preferred to see fuller particulars supplied to prove this assertion; and especially as to how much the Municipality save on their old street lighting bill. In Sydney itself, no great progress has been made with systematic electric lighting; and for this, not the gas interests, but the Labour Party in the Colonial Legislature are blamed. Very few country towns are stated to have adopted electric lighting; but for this no reason is offered.

Mr. Spencer has apparently no personal acquaintance with Melbourne, so he takes us to Western Australia, or Westralia as the friends of the youngest of the Australian family of Colonies prefer to style it. He here introduces us to the promising city of Perth—the capital. There is in Perth a central electric lighting station with a 100-horse power plant—again, owned by the local Gas Company. Street lighting is not at present undertaken; but that the station is doing pretty well may be inferred from the statement that extensions which will double the capacity of the plant have just been taken in hand. Mr. Spencer is to be thanked for his caution that, though at Coolgardie and several other towns electric lighting companies have been formed, "there is certainly not much scope at present in Western Australia for the large Syndicates now forming in England for the purpose of supplying electric light and power on the mining fields." He remarks further on this head that, "in a recent report in connection with one of these concerns, it was stated that the introduction of electric motive power on the mining fields would solve the fuel and water problem; but in what manner was not explained. Probably there will be a large demand for oil-engines." It does not seem to have occurred to this, on the whole, candid reporter that in this recrudescence of absurd claims in regard to the capabilities of electric lighting and power plants may be found the true reason why the enterprise has so lamentably "hung fire" all over the Continent, except in a few places where real men of business have taken it in hand for what it may prove to be worth in the ordinary commercial way.

A HOME OFFICE REPORT ON DANGEROUS TRADES.

WHAT constitutes a "dangerous trade?" The question is suggested by the appearance of a Home Office paper, entitled the "Interim Report of the Departmental Committee appointed to Inquire into, and Report upon, Certain Miscellaneous Dangerous Trades." The Committee consisted of three members, with a secretary, and appear to have gone to work with a will upon the reference submitted to them, which was sufficiently curious. The Secretary of State was advised that further information was desirable with respect to the conditions of work as they affect the health of the operatives in a strange list of "trades," beginning with india-rubber works, including electric-generating works, and not overlooking the use of inflammable paints, and the testing of bottles by compressed air. It is impossible to resist the suspicion that, in calling these operations or processes "trades," the authorities of the Home Office must have become infected with some of the Trade Union spirit which so dignifies any occupation followed by enough operatives to support a professional "organizer." However this may be, the Committee duly met, and considered the subject-matter referred to them; their sittings have already occupied sixty-four days; and they have extended their inquiries into England, Scotland, and Ireland, visiting 134 works, and examining 153 persons. They appear to have formed the opinion, from the results of this inquiry, that certain of the "trades" which have engaged their attention stand in urgent need of definite regulations, founded upon the ascertained facts, for the safety of the lives and health of the workpeople employed. This is the justification for the presentation of an interim report, in the formulating of which, however, the Committee have found themselves constrained to make recommendations that hardly come within the scope of existing legal and technical regulations and conditions. These refer specially to the use of locomotives in factories, and to the use of inflammable paints, in both of which it is doubtful within what limits the special rules can be legally applied. Here, again, we are confronted with the unsatisfactory character of the term "dangerous trades" as applied in this connection. Indeed, the case of electric generating works is so complicated by technicalities of this character that the Committee have not found it possible to include in the present interim report their observations and recommendations on these establishments.

Consequently, the first emphatic recommendation made by the Committee refers to the importance of settling these and other similar questions which will inevitably arise. For this purpose, they venture to suggest that, in any amending or consolidating Factory Bill, the words "factory or workshop" shall be deemed to include any premises, areas, or occupations whether in the open air or not, in which manual labour is employed for purposes of gain, and which are prescribed by order of the Secretary of State to be made in accordance with section 65 of the Factories and Workshops Act, 1878. The Committee proceed to explain that they have been guided in their present inquiry, and in the recommendations which they venture now to put forward, by a due regard for the position of the trade with which they deal, both with reference to the state of the labour market in that industry, and to the amount of foreign competition. "Their desire is to avoid unnecessary hampering the manufacturer in the legitimate exercise of his business, and also to protect the employees, where it is obvious that such protection is necessary." The Committee believe that, by the introduction and enforcement of the special rules which they now recommend, the double object they have in view will be arrived at. They are careful to explain that, in most instances, the precautions they suggest, so far from pressing heavily upon the manufacturers, are those which they have seen put in practice by the best and most careful employers. In the other and less numerous instances, where a trade or a process has been carried on without adequate precautionary measures, they express their conviction that their recommendations are "what the dictates of reason and humanity would suggest."

All this is very well; but the whole tenor of these observations is unquestionably in the direction of more Government regulation, of more inspection, and also by inference of more outside interference with the conduct of industry. It is not as if the purview of the Committee were restricted to what would be generally recognized as dangerous trades, even in the light of technical knowledge of the materials used and the processes followed. When it is remembered, on the other hand, that the Committee have themselves included the use of locomotives in factories as constituting a "dangerous trade," it becomes obvious that the door is thrown open for an almost infinite extension of governmental interference in this regard. The fact appears to be that, inasmuch as there is reason for the enlargement of the legal term factory to include any centre of industrial labour, it follows that the term "dangerous trade" might equally be interpreted to cover certain extra-hazardous kinds of work, regularly or occasionally required to be performed in almost every industrial occupation. How far these branches of labour can be usefully brought within the scope of special rules, is a question more easily asked than answered.

This latter observation receives special illustration from what the Committee have to say concerning the use of steam locomotives in factories—almost the sole division of the Interim Report which we can discuss in detail. They declare that trains, trucks, and locomotives in works of various kinds are a fruitful source of accident. They might say as much of horses and carts; and they do, indeed, include travelling-cranes in their strictures. They observe, among the causes of accident with trains, &c., that "the rails may be laid too close to each other or to some permanent structure, such as a pillar or a wall, so that men are liable to be crushed by passing trains. Very often heaps of raw material or rubbish are deposited close to the rails, and in the dark are a considerable source of danger; men are liable to trip in passing to or from their points, fall upon the rails, and be run over, or to be crushed between the heap and a travelling engine." Coupling and shunting are classed as dangerous work; and the employment of gantry rails for trimming heaps of material, coal, &c., is discussed as hazardous, because sometimes these structures are defective. This criticism will strike most works managers as being carried rather far; but this is not all. "Where the engine is attached by means of a long chain to waggons or to cinder bogeys which contain hot metal or other substance, a man sometimes trips over the chain, which he does not see, and is run over. Or, again, the engine is on a different set of rails from the trucks, but parallel to them, and a pole or prop is used to push them. Should the prop break, the man in charge who holds it in position to prevent it slipping is liable to be most severely injured." Very sound criticism, doubtless; but hardly pointing to the possibility of effective outside control of such operations, assuming them to be necessary.

The influence of Trade Unionism betrays itself in the Committee's recommendation that "no person should be in charge of a locomotive who has not been granted a certificate of competency." We have heard something like this before; and, when we turn to the appendix referred to in support of these counsels, it is not surprising to find a list of particulars of accidents caused by the use of locomotives in factories headed "Northern United Enginemen's Association." The certificate of competency is a stock plea with those who know that it would go far to make an efficient trade society, whatever might be its effect upon the work of the factories. Unfortunately for the validity of this contention, it has nowhere been proved that any certificate of competency is equivalent to a good personal character; and it is significant that the railway companies prefer the latter to the former.

The other recommendations of the Committee respecting the use of locomotives on the ground and upon gantries in factories are in the main sensible, although some of them are rather reminiscent of the wisdom of a coroner's jury. They advise the use of coupling sticks wherever practicable; and also that on each side of a set of rails there should be a footway 3 feet wide between the rail and any fixed structure or heap of material. The sufficiency of the latter precaution will depend largely upon the character of the waggons used on the railway and the nature of the loads. In some cases, it would certainly not be room enough to ensure safety at all hours. Again, "all gantries should be provided with hand-rails; and the space between such hand-rails and the railway line should be not less than 4 feet; the gantries should be properly constructed, and kept in proper repair"—and so should roads, and every other working appliance about the place, or the proprietor would hear of it in case of anything going wrong. There are eighteen such recommendations in all; and they exhibit a queer mixture of good sense and futility. For the purposes of special rules on this subject, the word locomotive is to include all travelling-cranes worked by power, and all lines not on the public railways under the jurisdiction of the Board of Trade, which are traversed by locomotives, trucks, or waggons, in the business of a factory, are to be considered as being within the close or curtilage of such factory.

The dangers of working with carbon bisulphide and naphtha scarcely come within our purview, although these materials are not without their special interest in other ways to the gas engineering world. With regard to the use of what are called distinctly "inflammable paints"—meaning those quick-drying paints introduced of late years for the protecting of ships, &c., the Committee entertain very strong opinions which will be found highly consolatory by the older established oxide paint manufacturers. The new paints have a spirit instead of oil medium; and the Committee state that they have heard of many cases of accidents through the use of these compositions. The risk due to this use is twofold—there is the risk of fire, and that of intoxication, followed by unconsciousness and asphyxiation by the inhalation of the fumes. The latter result is not uncommonly seen in more modified forms, such as a temporary loss of the faculties, and many of the same effects as are produced by drunkenness. Having regard to this double set of risks, the Committee are strongly of opinion that the danger of fire is more than doubled by the danger of intoxication and asphyxiation, inasmuch as, where the latter take place, a fire very commonly ensues; and where both occur—the one resulting from the other—most grave, if not fatal, results are the consequence. Here the Committee speak wholly out of regard for the workmen; but if their indictment is well founded, the use of these paints must be equally detrimental to the interest of employers. So, indeed, the Committee eventually conclude, though by a roundabout process of reasoning. They

recommend that no such paint should be permitted to be used in any confined space, or where naked lights are employed; and they wind up some suggestive recommendations on the subject by stating that all ships undergoing the process of painting or repair should be classed as "factories" for the purpose of the application of special rules. The further investigations of this Committee bid fair to be even more interesting than those which have been made the subject of this interim report. We look forward particularly to what they will have to say on the subject of electric generation.

PERSONAL.

Mr. W. P. HUGHES has resigned the Chairmanship of the Water and Sewerage Committee of the Worcester Corporation. At last week's meeting of the City Council, he was invited by the Mayor to state his reasons for taking this step. It seems, from his remarks, that he doubts "the competency of the City Engineer;" and therefore cannot have the confidence in him that should exist between the Chairman of an important Committee and its advising official. Mr. Hughes gave two or three instances in which the City Engineer has failed to satisfy him; one being the occasion when the Committee were induced to recommend the Council to adopt electricity as the motive power at the water-works, in the belief that there would be a saving of at least £600 a year. Events have certainly proved that some one blundered in this case.

OBITUARY.

The members of the Eastern Counties Gas Managers' Association will regret to learn of the death of Mr. W. T. GIDNEY, the Chairman of the East Dereham District Council, who, on the occasion of the meeting of the Association in April last, gave the visitors a most hearty and hospitable welcome. The deceased gentleman was 67 years of age. His death, which occurred at Lowestoft, was painfully sudden. After returning from a walk on the evening of last Friday week, he fainted, and never recovered consciousness.

Electric Traction for Tramways.—At a meeting of the Tramway Institute of Great Britain and Ireland, Mr. J. Sturgeon, in reading a paper on "Mechanical Haulage," thoroughly condemned the use of electricity for tramways, stating that it was too expensive, and was also eminently unsatisfactory, more especially as to the damage done to gas and water mains, &c. He said that a new era of experimenting in conduit systems had been entered upon. But it was a vain hope. There was nothing in the nature of underground or conduit systems that could in any way help to lessen the cost. On the contrary, the capital cost was much higher, and, with all the complicated and delicate electric appliances under the street, the maintenance also would certainly not be likely to prove less.

Eastern Counties Gas Managers' Association.—An interesting programme has been arranged for the autumn meeting of this Association, which is to be held to-morrow week at East Retford. In addition to the ordinary formal business, a paper is to be read by Mr. R. G. Shadbolt on the "Self-Enrichment of Gas;" and Mr. W. J. Jenkins, Assoc.M.Inst.C.E., of the Beehive Iron-Works, Retford, will contribute some observations on the "Construction and Working of Regenerator Settings." There is also to be a discussion on the, at present, peculiarly appropriate subject of "Residuals." Apparently there is to be no restriction as to this following any particular groove; so that there is room for a good and diversified debate. A proposal that future spring meetings be held at Cambridge will be considered. The Gas Committee of the Retford Corporation have invited the members to luncheon at the White Hart Hotel; and they will dine together at the same place in the evening. For those who can remain the following day, a drive through the neighbourhood of "The Dukeries" is being arranged.

Gas and Water Companies' Directory and Statistics.—Messrs. Hazell, Watson, and Viney, Limited, forward a copy of the twentieth issue of the "Gas and Electric Lighting Companies' Directory and Statistics, 1896," bound up with the "Water Companies' Directory and Statistics, 1896." Previous issues of this work have been duly noticed in the "JOURNAL;" and consequently little need be said about the present book beyond an intimation of its publication for the benefit of any of our readers who may need such information as it contains. The publishers state that the work has been revised to July, 1896, and the information given is much more complete than in any former issue. In addition to the lists previously given, they have added a general index of officials, engineers, and managers in both the gas and water sections. Of course, in a work of reference, everything depends on the accuracy of the so-called "facts" set forth; and this cannot be verified without extended research. It does not however give confidence, in casually opening the book at a page in the water-works section, to find this note: "There is no Institution wholly given up to water engineering questions in England." As a matter of fact, the British Association of Water-Works Engineers was founded as long ago as January last; and its proceedings have been duly chronicled in our pages down to the annual meeting held in July at Nottingham.

NOTES.

Acetylene for Photometric Purposes.

At a recent meeting of the French Physical Society, M. Violle recommended the use of acetylene for photometric purposes. The gas, after being compressed in a bomb, leaves it under a pressure equivalent to a 30-centimetre water column, and passes through a small conical mouthpiece, where it absorbs enough air for combustion, which takes place in a burner of the Manchester type. The flame is protected against the surrounding air by a double metallic casing. By using only a part of the flame, photometrical values ranging from 5 to 20 candle power are obtained. The total flame represents 100 candles, and can be increased to 125 candles by increase of pressure. Two diaphragms, one on each side of the burner, are provided with scales which indicate the lighting power of the flames measured. The colour of the flame can be changed, and consequently its power of incandescence. If the pressure is increased, the flame adopts a rose-red tinge which is noticed in the combustion of carburetted substances if occurring at high temperatures.

A Photographic Method of Testing the Verticality of Structures.

Mr. A. Mallock has submitted to the Camera Club a description of a photographic method of determining the true vertical in buildings, &c., which appears to be ingeniously worked out. Mr. Mallock observes that to plumb the profile of a lofty structure is a matter of much greater difficulty than might at first sight be supposed. His proposed method depends on the obvious fact that a line joining any point of a structure with a reflection of the point in the free surface of a liquid is a true vertical line. Accordingly he proposes the expedient of photographing the structure from two bearings—at right angles, or nearly so; the camera having just in front of the lens an artificial horizon, in which the reflection of the structure appears, and is photographed at the same time. Such photographs give a lasting record of every visible detail, as regards its relation to the vertical, at the epoch at which the picture was taken, which can be analyzed at leisure, and with reference to any part concerning which a question may arise. Mr. Mallock explained the working of his arrangement in detail, with the geometrical proof of its accuracy. The broad result obtained was that, if a structure photographed is rather more than an inch high on the plate, a departure from the vertical of between 1′ and 1′30″ of arc could be detected—an angle which corresponds to 1 or 1½ in. in 100 yards. So that, if a tower 300 feet high was much more than an inch out of plumb, it would be detected with certainty. Mr. Mallock exhibited photographs of well-known public buildings and monuments illustrating his method, which showed among others that the spire of Salisbury Cathedral is curved, all the deflection being to the north-west, and amounting to 11 inches nearly. Mr. Mallock has also in the same way measured the deflection of bridges.

Laboratory Use of Acetylene.

Writing to "Nature," Mr. A. E. Munby, of Felsted School, describes the apparatus he uses in place of spirit-lamps, "benzoline roarers," and the like, for blow-pipe work. It consists of an aspirator holding about 15 litres, permanently connected with a water supply, and possessing a ¼-inch aperture exit tap (the water flows in from below to minimize absorption). At the top, a three-hole rubber cork carries an upright pipe passing through the table, which serves for filling the aspirator with gas, or using the gas on the table; a second pipe goes to the blow pipe; and a third carries an open mercury manometer. For filling the jar, the calcium carbide is placed in a 4 oz. bottle closed by a cork carrying a small separating funnel from which the water drops. The gas passes to the aspirator through a wide glass tube which acts as a reversed condenser, returning most of the water vapour to the bottle. With the large exit to the aspirator, the gas can always be collected under a greatly reduced pressure of mercury, which quite provides against any sudden rushes of gas. The operation takes some ten minutes, and requires practically no attention. In using the gas, the water is turned on with all taps closed for a few seconds, to correct any reduced pressure caused by absorption, as shown by the gauge (this is very slight indeed); and then the gas-tap is fully opened and the flame regulated entirely by the water entrance. To bring the gas into use takes hardly any longer than with an ordinary gas blow-pipe. A good fusion on platinum foil ($BaSO_4 + Na_2CO_3$) may be effected by using about one litre of the gas. The apparatus has been used for about two months, and Mr. Munby recently discovered that some of his junior workers did not know what acetylene smelt like, which speaks well for the plant. Mr. Munby is hoping to introduce the gas on to the benches if the difficulty of the enormous quantity of air required to produce a non-luminous flame can be overcome.

Microscopic Faults in Steel.

Mr. Thomas Andrews, F.R.S., has conducted a series of examinations of samples of steel, with the object of discovering the existence in commercial sections and castings of microscopic internal flaws inducing fracture. The results of this investigation have been published in full in "Engineering." Many instances prove from actual experience that large steel shafts, however well they may be constructed, are rendered

liable to sudden and accidental fracture from the deterioration of metal consequent on their being continually subjected to heavy torsional and other stresses; the liability to fracture being often increased by the presence of even minute quantities of sulphur and other impurities. Fractures of wrought-iron axles and shafts do not appear so liable to occur from the above cause. Mr. Andrews claims that, in addition to the presence of hollow piping holes, blow holes, gas or air cavities, or other internal flaws of a larger character in steel, his research has demonstrated the existence of numerous internal micro-flaws or germs of metallic disease in various large and most important pieces of structural steel, including bridge girder plates, boiler plates, &c. The presence of these numerous micro-flaws in steel is replete with inherent potentialities for evil, tending to facilitate the determination by fatigue, to reduce the permanent stability of the forgings, and to promote their premature fracture. Notwithstanding this, Mr. Andrews desires it to be understood that, as a metallurgical engineer who has devoted much study to the subject, he yields to no one in appreciation of the admirable qualities and special properties of steel for varied and extensive purposes, though he does not regard it as capable of universal application. It is, moreover, not desirable to be always occupied with contemplating the perfections of a metal; and although the study of imperfections is not a pleasing subject, nevertheless it would be unwise for engineers to ignore the study of the latent faults in steel, or to be devoid of a knowledge of those minute incipient causes which are too often potent in producing the premature determination and fracture of metallic structures. Mr. Andrews is still prosecuting his high-power microscopical investigations of steel sections, and hopes to be able ere long to offer suggestions which may tend to the improvement of the material.

A Recent Example of Ventilation.

The study of the problem of the ventilation of domestic interiors is, or should be, materially assisted by records of what is being done in this regard in modern examples of special structures, such as hospitals, in which the general problem receives a highly important specific development. Hence it is interesting to note that Mr. T. W. Aldwinckle, the Architect of the new Brook Hospital for fever patients, at Shooter's Hill, has elected to dispense with mechanical ventilation, doubtless in order to avoid the difficulty created by *plenum* chambers, air-ducts, and such-like tubular arrangements which depend for their efficiency on the perpetual motion of a piece of machinery. Mr. Aldwinckle warms his wards by means of open fire-places and low-pressure hot-water apparatus. The open fire-places have been made by Messrs. Hendry and Pattison, under the architect's supervision, specially for this hospital. Fresh external air is supplied to them through a short channel, and is warmed, and then passed into the ward. The water-heating arrangement consists of radiators supplied from a furnace in the basement. These radiators are composed of a number of spiral copper coils enclosed in easily cleanable iron casings opening on top and in front. They are placed against the external walls under the windows; and the fresh external air is admitted to them through valved channels in glazed brickwork, afterwards escaping into the ward. There are also valvular gratings in the external walls under each bed at the floor-line; and there are the windows—one to each bed—on the opposite sides of the ward. The ordinary double-hung sashes are supplemented by hopper-hung fanlights. For the exhaust, in addition to the fire-places, there are vertical shafts, 14 inches square internally, lined with salt-glazed bricks, and having the internal angles rounded. An upward current is generated in these shafts by means of a steam coil. To each shaft there are two inlets, one at the ground line and another at the ceiling, controlled by flaps so connected mechanically that while one is open the other is closed.

Thorium Nitrate.—Concurrently with the spread of incandescent lighting, a continued fall in the price of thorium nitrate is evident in the reports from the German markets. The latest quotations are about 36s. per lb.; while in January, 1895, the ruling price was about £40 per lb.

Institution of Junior Engineers.—The summer meeting of this Institution was held in Scotland last month, in accordance with the general outline of the proceedings given in the "JOURNAL" for the 18th ult. (p. 330). The morning of the last day of the meeting was spent by a considerable number of the members in visiting the Dawsholm Gas-Works, where they were received by Mr. W. Foulis, the Gas Engineer of the Glasgow Corporation; while other members inspected Sir William Arrol and Co.'s works, and the sewage precipitation works. The Glasgow electric-lighting station was also available for visiting during the evening. Altogether the meeting passed off most successfully; and the occasion distinctly indicates the great advantages which the younger members of the engineering profession have the opportunity of enjoying under their own administration. The membership of the Institution, we understand, now numbers over 450. One pleasing feature of the meeting was the fact that, in recognition of his efforts in promoting and carrying out the arrangements, a presentation was made to the Secretary, Mr. W. T. Dunn, in the course of the proceedings at the annual dinner on the 21st ult.

TECHNICAL RECORD.

INSTALLATION OF A CARBURETTED WATER-GAS PLANT AT SOUTHPORT.

The Southport Corporation have just completed an important addition to their gas-works at Crowlands by the installation of a carburetted water-gas plant designed for an ultimate production of 1,500,000 cubic feet per day. The addition of this supplementary plant has been rendered absolutely necessary by the steadily increasing requirements of the district supplied by the Southport Corporation Gas-Works, where the make of gas has steadily risen from 128,711,000 cubic feet in 1876, to 219,732,000 feet in 1886, and to 357,485,000 feet in 1896. These figures will show the rapid expansion of the borough, and the continued exertions required at the gas-works to meet the growing demand for gas. In 1894, the Gas Engineer (Mr. John Booth) reported that further additions were imperatively required; and shortly after this report, carburetted water gas was brought to Mr. Booth's attention by Mr. Stelfox, who was then erecting this class of plant at the Belfast Corporation Gas-Works. Mr. Booth was instructed by his Committee to visit Belfast, to see the plant which was then at work, and to report upon it. The Gas Committee also appointed a Sub-Committee to visit Beckton and Kensal Green, where carburetted water gas was being made. What they learned of this system of gas-making commended it to both the Engineer and his Committee; and a contract was entered into with Messrs. Humphreys and Glasgow for the supply and erection of a plant equal to 750,000 cubic feet of gas per day.

This supplementary plant for the production of carburetted water gas was formally opened by the Mayor of Southport (Mr. George Eastwood), on Tuesday last; the Chairman and other members of the Gas Committee and a number of councillors and invited guests assembling at the Town Hall at 3 o'clock in the afternoon, from whence they were conveyed in carriages to the Corporation Gas-Works at Crowlands. The illustration on next page, taken from a photograph, shows the general construction of the plant which has been put down. The plant, it may be added, is constructed in two sections, each of which may be used separately or both together; the present installation being designed to produce (as already stated) 750,000 cubic feet of gas per day, but capable of ultimate extension to double this quantity. The plant consists of two generators, each 6 ft. 2 in. by 15 ft. 6 in.; two carburetters, each 6 ft. 2 in. by 17 ft. 9 in.; two superheaters, each 6 ft. 2 in. by 25 ft., with washers, scrubbers, and condensers; two steam-engines and two blowers, each of sufficient capacity to work the two sections of the plant; two Cornish steam-boilers, each 26 ft. long by 6 ft. 6 in. diameter; two engines and exhausters, each rated to pass 35,000 cubic feet of gas per hour, and each of sufficient capacity for the two sections of the plant when working together. There are also two oil storage-tanks, having a combined capacity for 60,000 gallons; and an additional tank has been constructed outside Messrs. Humphreys and Glasgow's contract—this one having a capacity of 140,000 gallons. The new buildings which have been erected for the plant consist of a generator-house (space being left for a duplicate set), machinery rooms, and boiler-house, with space for an additional boiler. Generally it may be stated that the installation put down includes full duplicate plant for the future extension of generating plant, and is entirely self-contained, within a completed building equal to all requirements of the extended plant, and conveniently located upon a plot of ground at the end of the retort-house. By this arrangement not only is the retort-house wall and the water supply adjoining advantageously utilized, but coke direct from the retort-house can be conveniently fed into the generators. It may be added that the buildings have been erected by the Gas Committee from plans prepared by Mr. Booth, under whose supervision the whole of the work has been carried out.

On their arrival at the Crowlands works, the party at once proceeded to inspect the plant, the working of which was explained to the visitors by Mr. Booth and the representatives of Messrs. Humphreys and Glasgow.

Mr. Dimond, the Chairman of the Gas Committee, briefly opened the proceedings by giving a short review of the course of events which had led up to the erection of the new plant, and the completion of which would form a special and important event in the history of the Southport Gas-Works. The Corporation, he said, as they would presently see, had introduced a splendid installation of the carburetted water gas method of making gas. Reviewing the motives which had led to the adoption of the new system, he emphasized the difficulties which had confronted the Gas Department in the winter months, when the temperature was at its lowest point, and the result of which was that they were driven to seek some means of supplementing their gas producing powers. Had they extended the old system to the necessary point, by the erection of a gasholder, the cost to the ratepayers would have been £20,000, as compared with £11,000 which would be the cost of the present apparatus. Then one great advantage of the new system was that, instead of taking three days to complete the manufacture of gas for any special emergency, it could now be made and supplied to the consumers

in three hours after the first starting of the process. The plant was likely to cost little more than the contract price; and, in his opinion, the contractors had done their work very well indeed. There had been no friction whatever; and every possible attention had been paid to the requirements of the work. Mr. Dimond concluded by inviting his Worship, the Mayor, to perform the ceremony of opening the installation.

The Mayor, after referring to the origin of the carburetted water-gas method in America, where it had been in operation for a considerable number of years, said the system which had been so successful in the United States had been introduced to the knowledge of English gas engineers as a result of the great strike in the coal trade. In the course of their investigations into systems that would make them comparatively independent of coal, they inquired into this carburetted water-gas system, and soon found that it had many advantages over the one which obtained in the United Kingdom. It was soon put to a practical test in England; and to show the manner in which it had "caught on," he might mention that since two years ago, it had been adopted by twenty gas-works (corporation and company), and the gas-making capacity of the main plants now reached 30 million cubic feet per day. He was quite sure, if this success was continued, the system would extend very rapidly indeed. The Mayor also referred to Mr. Dimond's remarks as to the relative cost of the new and old systems of gas making; and he pointed out the advantage of being able to double the gas-making capacity of the plant by erecting another similar apparatus in the space left open for the purpose. With regard to the storage of oil, the store at present in hand were equal to a month's supply of gas to all the inhabitants of Southport and district in the depth of winter. He hoped that the gas made by the new apparatus would be as pure as it was possible to obtain it. Its illuminating power was, he understood, very considerable indeed; and he trusted that the test to which it would be put would prove this.

Mr. Watson, the Vice-Chairman of the Gas Committee, moved a vote of thanks to the Mayor for his attendance; and, on behalf of the Gas Committee, he presented his Worship with a framed photograph of the new portion of the works, as a memento of the occasion.

The Mayor, having acknowledged the vote of thanks and the gift, formally set in operation a portion of the apparatus; and Mr. Booth, having announced that the process of gas-making had commenced, further intimated that the gas, the manufacture of which had been set in operation by the Mayor, would be used for illuminating the town in the evening. The guests then had their attention drawn to a gas-jet affixed to one of the chambers of the apparatus, and were afforded an ocular demonstration of the quality of the carburetted water gas being manufactured. The flame emitted was, however, said not to represent the very highest illuminating power obtainable; and it was stated that the average light would be equal to about 25 candles. The party next saw the furnace fed; and after that there was a tour of inspection round the works.

On returning to the Town Hall, the guests were entertained to tea by his Worship, the Mayor, who, at the conclusion of the repast, made a short reference to the day's proceedings. He remarked that if the age was noted for one thing more than another, it was for its progress, an illustration of which had been furnished that afternoon. They would, he thought, having seen the new apparatus, appreciate the quickness with which it was put in operation, and the rapidity with which gas was made, and come to the conclusion that it was far in advance of the old method. It did not seem to him to be half as dirty as the ordinary process of gas making; it was less laborious; and the amount of mechanism required was considerably less. He was informed that, if it had been decided to extend the premises on the old principle, ten times as much room would have been required for plant which would only produce the same quantity of gas that the new process would. It was somewhat strange that this method of gas making should have existed for so long in America without earlier coming into use by any English gas engineers. They had, however, he supposed, got into a groove, and it required a severe shock to get them out of it. The necessary shock had, however, been administered; and those who had the management of public business in Southport desired not to be left behind in such matters. He was told that there was scarcely any limit to the illuminating power of the gas made under the new process; and he hoped this would prove to be the case.

Proposed Amendment of the Factories and Workshops Act, 1895.—Mr. J. H. Dalziel, M.P., has undertaken, on behalf of the Parliamentary Committee of the Trades Union Congress, to introduce a Bill to amend the Factories and Workshops Act, 1895; and it will contain several provisions which, if accepted by Parliament, may have some bearing upon the industries connected with gas and water supply. It is proposed to make applicable to all trades and occupations which are paid for on piecework, the regulation as to giving particulars of work; and all inspectors are to have a practical knowledge of the work to be inspected by them. It is also proposed to include a larger number of trades in the dangerous and unhealthy schedule; and to stretch the scope of the Act so as to embrace all vessels, as well as craft in port, river, dock, or canal. In all cases where manufacturing processes are carried on, work is to be prohibited from Saturday at twelve o'clock until Monday morning at six o'clock.

PACIFIC COAST GAS ASSOCIATION.

Fourth Annual Meeting held at San Francisco.

This meeting was held on the 21st and 22nd of July, under the guidance of the President, Mr. E. C. Jones, who delivered an inaugural address. He considered that the advent of new and competing forms of illumination had awakened the dormant resources of the modern gas engineer. The territory covered by the Association included an area of 717,310 square miles, equal to one-fifth of the whole of the United States; but in this there were only 66 gas companies, of whom 42 were represented on the Association roll. The combined New England States had an area of 66,192 square miles, and 136 gas companies, of which 78 were represented in the New England Gas Association. And their comparatively young Association was honoured with a larger percentage representation than any of the eight other Associations in the United States. A special feature was that they had no separate classes of members, as was usual with other Associations, but they all met on the same footing. After noticing the need of further discussion upon many points which some regarded as hackneyed, the President enlarged on the importance of uniformity in all things connected with their profession, instancing the various ways of answering the question, "What is the cost of the gas in the holder?" as a case in point. He recommended the appointment of a Committee to decide upon a uniform system of accounts. The question of uniformity in dimensions and weights of castings in ordinary use in gas-works, had already received some consideration in other Associations, and he exhibited a chart of standard dimensions that would meet the needs of their Association. Passing on to the subject of water gas, he said that with cheap Welsh anthracite, and oil at a reasonable price, water gas could be manufactured at a much lower cost than coal gas, besides securing other advantages. But a regular supply of oil at a fair price was indispensable. Naphtha had been used for this purpose until it reached a prohibitive price, and now the scarcity of oil, and the increase in price, had caused many eastern gas companies to go back, partly or wholly, to coal gas, and had stimulated the bituminous coal business in the east. Petroleum was largely produced in California, but the wells were some distance from the points where it was required for use, so that the freights became prohibitive in some cases. The total production in the State, in 1895, was over 1½ million barrels, of which about one-fifth was used for gas, and large quantities were disposed of under long-period contracts for use as fuel; a system that had the effect of tying up the remainder to some extent. Petroleum was also imported from Peru. After dealing pretty fully with the petroleum industry of California, attention was directed to the subjects of electrolysis, calcium carbide, and acetylene.

After the usual routine business, the hearing and discussion of papers was proceeded with. Mr. J. L. Howard, of San Francisco, commenced with a paper on "The Economical Uses of Coal." He remarked that most of the gas coal used in the district came from the Newcastle district in Australia, and most of the anthracite for water gas from the Swansea district in Wales. While the price of coals at the pit remained fairly constant, the varying rates of freight caused large differences in delivery cost. This was especially so in California, where the coal was delivered by ships that made the return journey with wheat. During 1895 there was a fluctuation of quite 4s. per ton in coal freightage rates. When freights were high, a great deal of trouble arose from hurry in shipping, resulting in the despatch of badly screened or dirty coal, or perhaps inferior brands. The variations in the quality of Welsh coals were not sufficiently appreciated. The most popular brand of gas coal from Australia was that known as Wallsend Sydney. In 1885, this brand represented no less than 85 per cent. of the Newcastle coal imported; but other mines had since been opened, and in 1895 it only constituted 39 per cent. of the total import. There was a singular disposition to trade on the popularity of the term "Wallsend," and all sorts of changes, such as prefixing "Young," "Old," "South," "West," &c., were rung upon it, to allow of coal being shipped and sold under that title. All this showed the importance of carefully testing the coals, and buying those only that yielded the best results. Attention was next directed to the combustion of anthracite under boilers with forced draught. The fan-blower and appendages being costly, the author was led to try superheated steam applied to an air injector, and this plan proved to be simpler, less expensive, and more easily attached. It was also found that, whereas the fan admitted cold dry air, the steam injector warmed the air, and charged it with moisture, which had a useful effect in softening the clinker, and facilitating the cleaning of the furnace bars. With the fan, the clinker was liable to fuse and adhere to the bars; and using water in the ash pit would not entirely prevent this difficulty. In practice, the evaporative power of the fuel was increased 3 to 5 per cent. by the use of the steam jet, as compared with the fan. This was due to the fact that the former produced a longer flame, which meant a more advantageous distribution of the heat. By a damper arrangement connected with the steam supply, the pressure in the boiler could be maintained constant within narrow limits.

The President, in opening the discussion, spoke favourably of one of the steam jet arrangements referred to in the paper, which he had been able to see at work; and he also read an extract from a magazine, describing Wegener's apparatus for burning pulverized coal, as used by Messrs. Bryan Donkin and Co., of London. Mr. Eichbaum remarked that the effect of steam in lengthening the flame was illustrated by the usual experience with retort furnaces. When shaking the bars to get the clinker off, the ashes dropping into the water in the ash pit would produce a long flame where none existed before. Mr. Britton referred to the importance of economy of fuel to most of the members who were concerned with electric light enterprizes. He had seen the steam injector, and was astonished at its effectiveness, and though he had not tried it himself, he heard very satisfactory accounts from those who had. It would be well if arrangements could be made with a responsible agent in Wales to look after the interests of Californian purchasers. Mr. Parker said he had seen the device at the Napa Woollen Mills, and was told that it saved 7 per cent. of fuel. Mr. Crockett said that the Welsh anthracite was very variable; but he had never known it to be so dirty as to cause spontaneous combustion. Mr. Howard, in reply, described the steam jet in detail. He gave several instances of spontaneous combustion in cargoes of anthracite, and said that some of the shippers did not care for long voyages with it. There was no doubt that firing with pulverized coal would yield a better duty than the same coal burned in any other shape, but there was the expense of working the pulverizing apparatus to be thought of.

Mr. M. C. Osborn, of Santa Cruz, read a paper on "The Relative Position of Consolidated Gas and Electric Light Plants." He remarked on the difference in the practical working of a gas-works, as compared with an electric light installation, and claimed that the great advance in electricity for lighting was due to the electric light being supplied by contract at a fixed rate, whereas the meter was rigidly adhered to in the case of gas. Take out the gas-meter, and give the consumer the choice of the two lights on equal terms, and gas would hold its own. But meters were a necessity to do a paying business with either agent. In dealing with the economy of the combined plant as compared with working the two separately, he said that outside the management and office the two were practically distinct. The cost of repairs and loss from deterioration were much greater at the electric works than at the gas-works, and the former called for the greater share of the manager's time and attention. There was no advantage with the consolidated undertaking in introducing improved gas-burners which would simply lead people to substitute gas for electricity; and he preferred to confine attention to the pushing of gas for fuel purposes. The methods of gas manufacture, &c., were now well established; while electricity was still in its infancy and therefore called for careful watching. But he considered that electricity, as at present generated, would never be able to compete with gas and pay as good dividends.

Discussion being invited, Mr. Adams remarked that he was fitting up a 100-horse power gas-engine to run with natural gas for electric lighting. Mr. Steinman said that at Sacramento they had a competitor in the shape of a water power company, and had tried electricity generated with steam against them; but found it a losing game. He was selling gas at 10s. 6d. per 1000 cubic feet, and the day consumption showed a steady increase. The water power company supplied 2000-candle power arc lamps, on a moonlight schedule, at £1 4s. 7d. per month for street lighting, and incandescent lamps by meter at 2½d. or 3d. per unit. They also ran street cars by electricity. He had already bought up three electric companies, and now, besides the water power company, another one was coming. Mr. Miller said that at San Bernardino he was supplying gas at 10s. 6d. per 1000 cubic feet, and making money; while competitors, supplying incandescents at 12s. 6d. per month and arc lights at 7½d. per night, were losing ground. If he owned the gas-works in a town, he would not mind buying up the electric light works at about a third of its cost, just to keep others out. At Vallejo an electric light plant which cost £4000, was sold for £300 or £400. In his own experience electric light plants had been secured cheaply, and he believed there was a demand both for gas and electricity. Mr. Crockett said they had felt the competition of electricity in the busiest parts of San Francisco; but the underground conduits cost £7500 per mile, so they could not go into the outskirts or any great distance to compete with gas at 7s. 11d. per 1000 cubic feet. The gas business was steadily increasing, notwithstanding. Gas people need not fear the electric light, especially if they looked out for the day consumption. Mr. Burrows was running a consolidated plant, and found it hard work to keep up the electricity department. Electricity produced by steam could not compete with gas, especially where the Welsbach burner was properly introduced. No small town could make money from electricity without a good city contract. Mr. Britton said that a year ago he was doing a good electric business, but the Welsbach burner had entirely upset it. The latter could not be hurt by any arc or incandescent competition. He would ask any gas man who had also taken up electricity, whether it would not have paid him better to let it alone. Many of the losses due to competition from electricity had been owing to the efforts of those who had apparatus to sell, rather than to straightforward trading.

Mr. Powers said he was originally a gas man, but electricity

was forced on him, and had been a burden ever since he undertook it. The Welsbach only cost one-sixth or one-eighth as much as the electric light, so there was nothing to fear from the competition of electricity. Take it all round, he believed in keeping out useless competition, and in holding the field by being prepared to furnish gas or electricity as required. Mr. Knight had been a gas man for over 40 years; but lately he found it desirable to take up electricity in order to keep out competition. Eventually he undertook both plants, and found he could work them together with advantage and economy. If he had a gas-works, and an electric company came along, he would believe in taking up electricity to keep them out. Mr. Gillespie said that although he took up electricity, he had a competing company to contend with, who cut rather heavily into his business. But lately, with the help of the Welsbach burner and of gas stoves, he had been able to gain ground again. Mr. Petch said that under ordinary circumstances, gas was a better money maker than electricity. At Eureka, a competing company was formed which ran rates very low for a time; but they soon found they could not make money, and eventually he bought the concern up. But the gas business was a good thing for a gas man to stay with. Mr. Cressey preferred to let the electric light alone, and keep to gas. The electric department was not profitable, and was a drag on the gas business. The public objected to both going into the same hands, and would raise a cry of "monopoly" and endeavour to bring in competition. Mr. Parker agreed that it was best to let electricity alone, as gas could hold its own.

(To be continued.)

THE DECOMPOSITION OF HYDROCARBONS BY HEAT.

(*Continued from p.* 369.)

II.—*The Decomposition of Hexane.*

In this series of researches, Dr. Haber was assisted by Herr G. Samoylowicz.

Three classes of liquid products occurred—viz., (1) unchanged hexane and some lower paraffins, (2) olefines, (3) benzene. Benzene was relatively a minor constituent of the mixture when the hexane was decomposed at a low temperature, and a method of estimating small quantities of benzene in paraffins was first looked for. Several known methods of determining benzene in crude benzols, &c., were tried, but found unsuitable, as was also a process based on the amount of acid required to prevent the aniline formed from the benzene distilling off from a very dilute aqueous solution. The increase in volume of concentrated nitric acid on dissolving benzene suggested a means of estimation. A pear-shaped agitating vessel, with stem divided between 20 and 45 cubic centimetres into fifths of a cubic centimetre, was used. For trial estimations, 20 c.c. of nitric acid cooled to 0° C. was put into the agitating flask, and covered with cooled gasoline from which the olefines and moisture had been completely removed. The liquids were thoroughly agitated; and when cool the upper and lower limits of the layer of gasoline were read on the scale. A known volume of benzene was added with a pipette, and the liquids were agitated and cooled. It was found by trial that with acid of from 1·495 to 1·50 sp. gr., and quantities of benzene from 0·3 to 0·7 c.c., there was no perceptible difference between the volume of benzene added and the increase in volume of nitric acid. As fiftieth parts of a cubic centimetre could be read on the agitating vessel, the delicacy of the test was sufficient for the purpose of these researches.

With mixtures of benzene, olefines and paraffins, it became necessary to first remove the olefines, which was done by agitation with bromine water, and titrating back any small excess with potassium iodide and thiosulphate. A measured large portion of this mixture was distilled at 110° C.; and an aliquot part of the distillate was treated by agitation with nitric acid in the manner already described. The benzene in mixtures containing not more than 4 per cent. could be determined with an accuracy of 0·33 per cent. The accuracy was not greater when the brominated mixture was dehydrated. Toluene was not found to produce considerable error when present in only the small amount in which it was likely to occur in the products under consideration. The quantity of olefines was deduced from the amount of bromine used. The mixture on which the blank preliminary tests were made contained amylene, hexane, and a little benzene. According to the equation—

$$C_5H_{10} + Br_2 = C_5H_{10}Br_2$$

2·29 grammes of bromine are equivalent to one gramme of amylene. The results of this determination are, however, possibly rather low.

When the quantity of benzene was low, a large proportion escaped condensation, and was carried forward as vapour. Berthelot had observed that benzene was absorbed by fatty oils; and Bunte has shown that it is completely retained by paraffin oil previously deprived of its lighter fractions, and cooled to 0° C. By distilling off the benzene at 120° C., and agitating with nitric acid, a result was found which was, owing to the presence of olefines in the distillate, too high. On the other hand, if this benzene was altogether ignored, and only that in the liquid form reckoned, the result was too low.

The gases liberated were analyzed by means of the Bunte burette, as used for testing illuminating gas. The olefines were absorbed by bromine water. The hydrogen was determined by fractional combustion, and the hydrocarbons by explosion. Three values were thus obtained—viz., the contraction, the contraction *plus* the carbonic acid formed, and the oxygen consumed. Working over water, the first value is found less exactly than the other two. The calculation was therefore made as follows: The contraction *plus* the carbonic acid was diminished by the amount which, according to the fractional combustion, was calculated for the combustion of the hydrogen. The oxygen used was likewise diminished by the quantity required in the combustion of the hydrogen. The two values thus found for the total contraction and the oxygen consumption gave on subtraction the quantity of hydrocarbons burnt, and, further, the oxygen consumed per cubic centmetre of this mixture of hydrocarbons. The oxygen consumption is a measure of the mean size of the molecules in the mixture.

The specific gravity of the gas was found by the Bunsen-Schilling effusion test, which gives the value for moist gas compared with moist air. For the specific gravity of the dry gas, a correction must be made, for which Slaby has carefully worked out a formula, in which, however, there is a small error, owing to the weight of a litre of aqueous vapour being regarded as also affected by the total pressure, instead of by temperature only. The mean pressure corresponding to the difference of level of the water within and outside the inner cylinder at the beginning and end of the test was taken for the reckoning of the pressure at which the gas issued from the orifice, and was accurate within the limits of the errors of the test. This mean pressure was equivalent to 13 mm. of mercury with the apparatus as used.

The determination of the specific gravity furnished the factor for calculating the weight of 100 litres of a gas. In one example, the specific gravity of the dry gas was ·77, and the weight of 100 litres was therefore 99·64 grammes. The volumes of the several constituents in 100 litres being known by analysis, the weights of all the other constituents were calculated from their known specific gravities; and the sum of these weights (=58·28 grammes) deducted from the total weight found (99·64 grammes) gave the weight (41·36 grammes) of the volume (29·6 litres) of olefines present. Hence the mean molecular weight of the olefines was calculated; and in the example quoted it proved to be 31·2. The weight of the paraffins present in the mixture was deduced from the consumption of oxygen per cubic centimetre, which is a perfectly legitimate method, as different mixtures corresponding to a given volume and given oxygen consumption will have the same weight. A gravimetric determination of acetylene was made by leading several litres of gas through ammoniacal silver solution, and converting the silver compound to chloride in order to permit of weighing.

Much thought was expended on the apparatus. A large stream of gas passed rapidly through a heated tube would not reach the temperature of the walls throughout its mass; therefore a narrow tube was chosen. It was $\frac{1}{8}$ inch in bore, and was twisted spirally to form a coil of $4\frac{1}{2}$ turns $1\frac{5}{8}$ inches in diameter and $\frac{3}{8}$ inch apart. The total length was 25 inches, the cubical content 4·9 c.c. (0·3 cubic inch), and the wall surface 9·65 square inches. The coil could be heated to 448°, 518°, and 606° by means of baths of boiling sulphur, phosphorus sulphide, and tin chloride; but at higher temperatures the glass showed signs of deformation. A brass coil in a bath heated by boiling zinc was tried; but the arrangement proved impracticable. It was found possible, however, to use a double walled bath of which the space between the walls was filled with boiling zinc chloride; and as the decomposition was found by test experiments to be similar between 600° and 800° C., this bath was also used as a simple hot-air bath. In this case the temperature attained by the coil was ascertained from a series of Prinseps' alloys* inserted in the asbestos-paper envelope of the coil. With a uniform supply of gas, and no change in position of the burner, a constant temperature was maintained within the bath.

The hexane was vaporized in an ordinary distillation flask, heated in a water-bath to 100° C.; and from the exit tube the vapour was led into the heated coil. After the coil came a spiral condenser leading into a flask which served as a collecting-vessel for the tar, &c., condensed. From this flask the gas passed through paraffin oil, previously heated to 250° C. to remove light constituents, contained in a Winkler worm cooled to 0°C. It then passed through an empty Winkler worm into the gasholder, which consisted of a glass aspirator of about 2·435 cubic feet capacity, provided with a gas inlet-tube, water exit-tube, a pressure-gauge, and a thermometer. The tar-collector and condenser were surrounded by a mixture of ice and common salt. All the parts of the apparatus were weighed before and after a test; and the pressure and temperature were observed for the calculation of the weight of gas. The hexane on which the experiments were made was prepared from a crude gasoline by treatment with fuming sulphuric acid, caustic soda, and calcium chloride. The pure dry gasoline was fractionated five times with a Le Bel-Henniger five-bulb column; only the portion which passed over between 63° and 68°C. in the two last distillations being used for the researches.

* See "JOURNAL," Vol. LXVII., p. 1033.

TABLE *showing the Composition of the Gas produced from Hexane at Various Temperatures.*

	Composition of the Gas actually Found. Volumes per Cent.							Composition of the Gas, Eliminating Air Present. Volumes per Cent.						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Temperature of Production °C.	606	730	820	820	820	..	1200	606	730	820	820	820	..	1200
Olefines (C_nH_{2n})	48·30	44·35	51·14	29·60	47·04	..	4·30	50·10	51·40	52·40	31·90	49·75	49·80	4·40
Paraffins (C_nH_{2n+2})	35·90	29·40†	33·02	46·01	34·71	..	22·10	37·20	34·10†	33·83	49·60	36·72	36·60	22·60
Hydrogen	10·20	11·32	9·72	13·54	10·28	..	63·60	10·60	13·10	9·96	14·60	10·87	7·80	65·20
Air	3·60	13·70	2·40	7·20	5·45	..	2·50	..	..	..	..	..	.	..
Carbonic oxide	..	0·50	1·15	1·60	1·21	..	5·80	..	0·60	1·18	1·70	1·28	2·00	6·00
Carbonic acid	0·45	0·20	0·85	..	..	..	0·70	0·46	0·20	0·87	..	..	..	0·70
Nitrogen	1·55	1·51	1·72	2·05	1·31	..	1·00	1·64	1·80	1·76	2·20	1·38	3·80	1·10
	100·00	..	100·00	100·00	100·00	..	100·00	100·00	..	100·00	100·00	100·00	100·00	100·00
Mean oxygen consumption per cubic centimetre of paraffins	2·45	..	2·51	2·534	..	..	1·96	..	..	..	..	..	..	..

† The percentage of paraffins in columns 2 could not be determined exactly; and the sum of the percentages of all the constituents exceeds 100.

Results of the Experiments.

Hexane heated to 448° C. and 518° C. (boiling sulphur and boiling phosphorus sulphide respectively) was nearly wholly recovered in the condenser; and only a small quantity of gas, consisting chiefly of air, passed on to the gasholder. No appreciable decomposition of hexane, therefore, takes place when it is heated for a short period to a temperature not exceeding 518° C.

A preliminary test at the temperature at which tin chloride boils (606° C.) having shown that there was decomposition of the hexane, the experiment was repeated with proper care. 82·95 grammes of hexane were passed through the coil in 6½ hours; and the products were distributed thus: Liquid in the tar-collector, 30·4 grammes; collected in the paraffin oil, 6·87 grammes; and gas, 44·03 grammes; while there remained 1·65 grammes unaccounted for. There was a very slight deposit of carbon in the coil. It was calculated that the rate of flow of the hexane vapour at the temperature and pressure prevailing in the coil was 3·64 c.c. per second, and the rate of flow of the gas passing into the aspirator calculated to the temperature of the coil 3·86 c.c. per second. Adding to this the vapours condensed, not less than 5 c.c. of gas must have passed out of the coil per second. The cubical contents of the coil being 4·9 c.c., it follows that every particle of hexane entering it was exposed to the high temperature for about one second. The yield of gas at 0° C. and 760 m.m. was 35·188 litres. Its specific gravity (moist) was ·967. Its composition is shown in column 1 of the table.

The following extremes for the composition of the mixture of paraffins may be deduced from the oxygen consumption: (1) Methane 25·16 and ethane 10·74, or (2) methane 33·75 and hexane 2·15, both of which make up the required total of 35·90. Traces of carbonic oxide, carbonic acid, and nitrogen, were derived from the air in the anterior portions of the apparatus; while the 3·60 per cent. of air was due for the most part to that enclosed between the coil and the gasholder at the beginning of the experiment. The mean molecular weight of the olefines was calculated (in the manner indicated earlier) to be 39. The acetylene estimation gave 0·053 per cent. by volume in the gas.

The "tar" had a specific gravity of ·685, and readily took up 0·448 gramme of bromine per gramme. By agitation with nitric acid, it showed 2·53 c.c. of benzene. The paraffin oil yielded up 4·24 grammes at 120° C., of which 1·8 c.c. was taken up on agitation with nitric acid. The yield of benzene, therefore, lies between 2·53 and 4·33 c.c. or 2·23 and 3·81 grammes. The quantity of olefines found in the "tar" by bromination was equivalent to 6 grammes of amylene. The total weight of olefines and benzene in "tar" was therefore 8·23 grammes, and the weight of the material unchanged was 30·40 − 8·23 = 22·17 grammes. The hexane which was actually decomposed was therefore 82·95 − 22·17 = 60·78 grammes. The composition of the material absorbed by the paraffin oil could not be determined with certainty; but probably at least 50 per cent. of it was olefines, and the balance unchanged hexane. There were in the gas 30·525 grammes of olefines and 11·4 grammes of paraffins. The following table shows the manner in which the hexane decomposed was distributed:—

	Grammes.		Percentage by Weight.
Olefines, liquid	6·000	= 36·525	60·00
" gaseous	30·525		
Paraffins, gaseous		11·400	18·70
Benzene	2·23 to	3·810	3·7 to 6·20
Hydrogen		0·320	0·50
Carbon and acetylene		traces	—
Undetermined in the paraffin oil—chiefly hexane and olefines	6·87 to	5·290	11·3 to 8·70
Loss		3·435	5·83
Total		60·780	100·00 (nearly)

These results lead to the following conclusions: (1) Hexane decomposes to a considerable extent at 606° C., yielding chiefly olefines and paraffins, but also, as minor products, hydrogen and benzene. (2) The quantity of paraffins and olefines produced, and the small extent to which hydrogen is split off, indicate merely a loosening of the hydrocarbon chain, and migration of a hydrogen atom, resulting in one paraffin and one olefine molecule being formed from one molecule of hexane. (3) Methane predominates among the paraffins formed, and constitutes at least 70 per cent. of them. It must therefore be concluded that the hexane chiefly breaks up by the splitting off of a terminal methyl radicle, with formation of amylene and methane. (4) The small quantity of liquid relatively to gaseous olefines, and the mean molecular weight of the latter, lead to the apprehension that the amylene formed partially decomposes into ethylene and propylene, or that the hexane is partially decomposed according to each of the following equations:—

$$C_6H_{14} = CH_4 + C_5H_{10} \qquad C_6H_{14} = CH_4 + C_2H_4 + C_3H_6.$$

(5) The amounts of acetylene, carbon, and hydrogen, if of common origin, point to a quite subsidiary bye-reaction; but whether they are due to one or more reactions, and what relation subsists between them, are undetermined issues.

(To be continued.)

Earl Percy on Water Supply and Electric Lighting.—The annual congress of the Sanitary Institute was held at Newcastle last week. The proceedings commenced on Wednesday, with an address by the President (Earl Percy), who is Chairman of the Northumberland County Council. Among the many subjects to which his Lordship directed attention were two in which our readers are more or less interested—water supply and electric lighting. In connection with the former, he stated that in no part of the country did this matter call more earnestly for attention than Northumberland, and he might add Durham. In the South and West of England, the lakes of Cumberland and Wales, and the great valleys of the Thames and the Severn present available features, though considerable outlay may be required to make them so. Even in the Midlands, the area between the backbone of the country and the sea is sufficient to receive a very considerable rainfall. But as the east and west coasts trend in towards the north, the catchment basin is straitened. The rainfall, too, on the east coast is far less than on the west; and there are very few natural lakes of any size. The drainage area of the basin of the Tyne is considerable; being no less than 1130 square miles. But those of the Wansback and the Blythe are only 131 and 126 miles respectively; and in both there is a large and rapidly growing population. Durham, with a population more than double that of Northumberland, has, in addition to her share of the Tyne and Tees, only one river of any importance within her limits. Besides all this, the subterranean operations, so largely carried on in both counties, often unavoidably lead to a diversion of the natural supply, and cause trouble and inconvenience. It is evident that, under these circumstances, the due apportionment of the stores at command is a matter of the first moment, not only as regards the present, but also with respect to the future. Turning to the question of electric light, he asked: Is it true, as is occasionally affirmed, that the general use of electric light threatens to be prejudicial? The answer is usually in the negative; and it is claimed that there is no reason why, if judiciously handled, this form of illumination should tax eyesight or health more heavily than the methods hitherto in use. Theoretically, said his Lordship, this may be the case. But in practice the amount of light afforded by installations is sensibly in excess of that with which our fathers were contented; and there are not wanting those who declare that both their vision and their general condition have already suffered. Is this imagination, or has it at any rate some solid basis?

EXPLOSION AND DETECTION OF ACETYLENE IN AIR.

At a recent meeting of the Chemical Society, Dr. Frank Clowes, of Nottingham, read a paper on the above subject. The following is the Society's abstract of it:—

The behaviour of mixtures of air with gradually increased proportions of acetylene, when brought into contact with flame, were studied by a method already described by the author. It enables mixtures in varied and accurately known proportion to be rapidly prepared. The proportion of acetylene was progressively increased from 1 to 82 per cent.

The mixture containing 3 per cent. of acetylene was the first which was affected by contact with the flame placed either above or below. A pale green flame slowly traversed the mixture; showing that it was feebly explosive. As the proportion of acetylene was augmented, the rapidity of combustion was increased, and even a small volume of mixture gave decidedly explosive effect. When 22 per cent. of acetylene was present, the explosive combustion of the mixture was attended with a slight separation of unburnt carbon. As the proportion of acetylene was increased, the separation of carbon was more marked. The limit of explosibility, as judged by the flame traversing the mixture, was reached when 81 per cent. of acetylene was present.

The range of explosibility of mixtures of air with acetylene, extending from 3 per cent. of acetylene to 81 per cent., is extraordinarily wide, exceeding that of any combustible gas yet experimented with. It seems highly probable that the appearance of combustion extending through the mixture with the higher proportions of acetylene, is partly due to acetylene being an endothermic compound. Accordingly, the combustion of a small portion of the acetylene in contact with the kindling flame, starts the decomposition of the remainder of the acetylene, with the production of heat and the appearance of combustion. This probably explains why air containing much acetylene becomes heated throughout, when it is kindled at one point, and thus extends the range of the explosibility of mixtures of acetylene with air.

In estimating the percentage of acetylene in air, if the amount does not reach the lower explosive limit of 3 per cent., the most convenient method was the passage of the air over a standard hydrogen flame, and an examination and measurement of the halo, or "flame-cap," which was seen in a darkened room over the hydrogen flame. A laboratory apparatus suitable for this purpose is nearly perfected, and will probably be found convenient as a means for measuring accurately the percentage of any combustible gas present in air. About 600 c.c. of the mixture are required for the estimation, which can be completed in a few seconds.

When air containing less than 3 per cent. of acetylene was passed over the standard 10 mm. hydrogen flame, the flame at once became yellowish green in tint. A halo, or "cap," was at the same time seen, the height of which increased so rapidly with the increase in the percentage of acetylene, that the last estimation was made by the use of a reduced 5 mm. hydrogen flame. The measurements of the "cap" over the 10 mm. hydrogen flame were as follows: 0·25 per cent., 17 mm. cap; 0·5 per cent., 19 mm.; 1 per cent., 28 mm.; 2 per cent., 48 mm. Over the 5 mm. flame, 2·5 per cent. gave a 56 mm. cap; and 2·75 per cent., a 79 mm. cap. When the percentage reached 3, it burnt throughout, giving no cap.

THE REVIVIFICATION OF OXIDE OF IRON.

We are indebted to Dr. W. Leybold, of Hamburg, for a copy of a paper prepared by him on the above subject; the following being an abstract translation thereof.

The revivification of oxide which has been used for the purification of gas is one of the most notable processes of inorganic chemistry. The oxide used is most generally bog ore, but is sometimes an artificial material. After fouling, it contains some free sulphur and iron sulphide; and "revivification" consists in the conversion of the latter into sulphur and hydrated iron oxide by the action of moisture and air under certain conditions. There is a trifling amount of ferrous sulphate also formed. The fouled oxide, when removed from the purifiers, is spread out in layers about 18 inches deep. Shallower layers are less favourable to the process. The temperature of the mass rises; and, even in the presence of an ample amount of moisture, it may reach from 140° to 160° Fahr. When the atmospheric oxygen has penetrated throughout the heap, the process is becoming completed; and the temperature begins to fall. To promote the action, the heaps are stirred so that the air has access to all parts. If the layer be too shallow, or if it be very cold, the process is hindered. If there is an ample store of oxide, the revivified mass will not be put into the purifiers within a week from the time it was taken out in a fouled state; and this interval will have sufficed for the change to be quite completed. But where store space is limited, or the stock is low, it may be desired to use the oxide again in less than a week; and the gas-works chemist will frequently have to say if it is completely revivified.

A method of answering this query has been devised, based on the measurement of the sulphuretted hydrogen evolved when oxide which is not wholly revivified is treated with hydrochloric acid. If revivification be complete, hydrochloric acid will not cause the evolution of a measurable quantity of sulphuretted hydrogen. The course of the revivification can be traced by testing samples (taken from below the surface of the heaps) at intervals. If the amount of sulphuretted hydrogen evolved from a given weight of the oxide immediately it is removed from the purifiers be taken as 100, daily tests of the same weight of material will show the percentage of foul oxide remaining. For example, 100 grammes of fouled oxide gave 974·4 c.c. of the gas. The mass was raked over twice during the next day; and 100 grammes then gave only 162·5 c.c. of gas. After similar treatment of the mass on the third day, 100 grammes gave only 14 c.c. of gas. No gas was found on the fourth day; and the revivification was therefore quite completed by that time. Even on the second day, a sample taken from the surface of the heap developed no gas.

The tests may be conveniently carried out by the aid of a wide-mouthed bottle, with caoutchouc plug, connected, by means of glass and flexible tubing, with a graduated measuring-tube open at the bottom, and immersed in a cylinder filled with water. Dilute hydrochloric acid is placed in the bottle; and a small vessel containing the weighed sample of oxide is carefully stood within it. The plug is put in; and the vessel containing the oxide is overturned into the acid. The sulphuretted hydrogen evolved displaces water in the measuring-tube; and the volume is read after adjustment of the water-level. A Bunte burette may replace the simple open measuring-tube; and the water-level may be adjusted by connecting, by means of flexible tubing, the nozzle of the burette with a small vessel containing water. The burette is, however, too small for the gas evolved from 25 grammes of oxide, which is found a convenient weight on which to operate in most instances, when the material is fresh from the purifiers. Under these conditions about 250 c.c. of sulphuretted hydrogen is evolved.

In order to gain further knowledge of the course of the revivification, lead piping was inserted in a heap of fouled oxide, so that it reached to the middle of the heap. Through it a sample of gas was aspirated each day, and analyzed. The results were as follows:—

	Volumes Per Cent.						
	First Day.	Second Day.	Third Day.	Fourth Day.	Fifth Day.	Sixth Day.	Seventh Day.
Carbonic acid	0·1	0·6	0·5	—	—	—	—
Heavy hydrocarbons	0·7	—	—	—	—	—	—
Oxygen	0·4	0·5	4·0	16·0	19·0	20·0	20·4

On the third day, when 4·0 per cent. of oxygen was found, tests showed that 97·5 per cent. of the material was revivified; while on the next day, when 16 per cent. of oxygen was present, the material was virtually completely converted. Thence the oxygen rapidly rose until the percentage was practically that in the open air. Therefore we have both direct determination and the estimation of the oxygen present in the gas in the interstices of the mass, as methods of ascertaining whether spent oxide has completely revivified.

THE EXPLOSION OF CYANOGEN.

The above subject has lately been dealt with by Professor Harold B. Dixon, M.A., F.R.S., Mr. E. H. Strange, B.Sc., and Mr. E. Graham, B.Sc., in a paper read before the Chemical Society. The following is the Society's abstract of it:—

Since it has been shown by previous investigators that cyanogen probably burns first to carbonic oxide, and secondly to carbon dioxide, both in ordinary flames and in the explosion wave, and since the burning of carbonic oxide to carbon dioxide appears to be generally conditioned by the presence of water vapour, it seemed of interest to investigate the course of the chemical changes occurring in the complete combustion of cyanogen.

The authors first measured the rate of explosion of cyanogen with an excess of oxygen. The conclusion drawn is that, when cyanogen is exploded with its own volume of oxygen, it burns directly to carbonic oxide. On adding a second volume of oxygen to the mixture, carbonic oxide is formed in the wave-front, and the heated carbonic oxide and oxygen combine behind the wave-front. On adding more oxygen, the formation of carbon dioxide is sufficiently rapid to affect the velocity of the wave itself. When one volume of cyanogen is exploded with four volumes of oxygen, the rate is 5 per cent. faster than the rate calculated on the supposition that the cyanogen is only burning to carbonic oxide in the wave-front. The formation of carbon dioxide, although without influence on the velocity of the wave in the faster explosions, is found to exert an influence in the slower explosions.

In order to study the intensity and duration of the flame following the explosion wave, photographs were taken of the jets of flame projected from the ends of long tubes filled with the explosive mixtures of cyanogen and oxygen. Since the wave travels faster than sound in the unburnt gas, the wave-front must reach the end of the tube before any other disturbance can be propagated through the gas. The jet of flame which is driven from the tube must accordingly be part of the column of burning gases following in the wake of the wave. When cyanogen is burnt with its own volume of oxygen to carbonic

oxide, the intensity of the explosion is very great; but only a very slight jet of flame is projected from the tube—the length of column of highly-heated gases must be short. But when cyanogen is burnt with twice its volume of oxygen to carbon dioxide, the explosion is less intense; but the jet of flame projected from the tube is long, and of considerable brightness. The column of highly-heated gases must therefore be long. If the extra oxygen is inert in the wave-front, it accounts for the superior brilliancy of the unimpeded reaction $C_2N_2 + O_2 = 2CO + N_2$ over the impeded reaction $C_2N_2 + 2O_2 = 2CO + O_2 + N_2$; and if the formation of carbon dioxide mainly occurs behind the wave, it accounts for the brightness of the jet of still burning gases thrown from the tube in the second case.

To obtain a direct record of the intensity and length of flame in the two cases, the explosion wave was photographed on a very rapidly moving film as it passed a short window in a long tube. The sensitive film was fixed round a light iron drum driven by a high-speed electric motor. Two tubes, each provided with a window, were fixed side by side—the first being filled with one mixture, the second with the other. The gases being fired simultaneously, the two flames were photographed on the same film. On developing the film in a long trough, each image received precisely the same treatment; and one could be compared with the other.

The front of the flame in all cases was sharply defined; but the rear dies away in a tail which gradually thins out. When cyanogen is exploded with its own volume of oxygen, an intense image of the window is produced, only slightly drawn out by the revolution of the drum, followed by a faint and short tail. When, however, cyanogen is exploded with twice its volume of oxygen, the image is not so bright, and there is no abrupt fall in intensity. The tail is much brighter and longer. These photographs accord with the view that cyanogen burns first to carbonic oxide, and that the formation of carbon dioxide is a secondary action.

Photographs were then taken, with the same apparatus, of the flames produced by mixtures of cyanogen with two volumes of oxygen (1) well dried, and (2) moist. No difference could be detected in the images of the flames. Water vapour, therefore, does not seem to affect the reaction between oxygen and the just-formed carbonic oxide. Similar photographs of the flames produced in mixtures of carbonic oxide and oxygen in the dry and moist state showed a marked difference. In the presence of steam, the flame is more intense and shorter.

The World's Coal Production.—The output of the principal coal-producing countries of the world was as follows in 1880: United States, 71,481,569 tons; Great Britain, 164,605,738 tons; Germany, 65,177,634 tons; France, 21,346,124 tons; Austria and Hungary, 16,713,000 tons; Belgium, 18,617,585 tons; Russia, 3,570,413 tons; other countries, 3,621,343 tons—total, 364,737,405 tons. The production in 1890 was as follows: United States, 157,788,657 tons; Great Britain, 203,408,003 tons; Germany, 98,179,309 tons; France, 28,756,638 tons; Austria and Hungary, 30,323,195 tons; Belgium, 22,453,471 tons; Russia, 6,633,219 tons; other countries, 12,048,616 tons—total, 559,591,108 tons. In 1895 the production was: United States, 193,117,530 tons; Great Britain, 212,320,725 tons; Germany, 114,524,186 tons; France, 30,273,699 tons; Austria and Hungary, 33,570,358 tons; Belgium, 22,507,371 tons; Russia, 8,367,357 tons; and other countries, 14,250,093 tons—total, 628,805,239 tons.

Electric Lighting and the Gas Industry in Germany.—The "Electro-technische Zeitschrift" recently published a mass of statistics relating to 36 works for the supply of electricity in Germany, half of them being municipal, of all kinds and sizes. The figures are somewhat antiquated; being for the year 1894-5. It is recorded that in this period there was a satisfactory increase in the demand for current, as compared with the previous year; the average being 43 per cent. At the same time there was a similar increase in the consumption of gas. According to one writer, the future of the gas industry in Germany now stands on a firmer basis than that of electricity. Incandescent gas-burners, gas-stoves, and gas-engines are stated to have left their rivals far behind. Electric light is charged for at rates ranging from 3·5 to 9 pfennige per hectowatt-hour, or from 4·2d. to 10·8d. per Board of Trade unit. Electricity for motive power costs 2 pfennige.

English and German Coal.—The Berlin correspondent of the "Daily Chronicle" has communicated some particulars as to the competition of English coal in Germany, upon which subject a paragraph appeared in last week's issue of the "Journal." He says that, from a report of the Oppeln Chamber of Commerce, it would appear that the coal industry in Upper Silesia—probably the most important coalfield in Germany—is not satisfactory. While the total output of the district exceeds that of last year by 868,000 tons, it is complained that most of this increase goes to Hungary and Bohemia and other parts of the Austrian Empire; and consignments to Germany have actually decreased. It is incidentally remarked that imports of English coal to German ports which in 1894 were 9 per cent. over the previous year, again show an additional increase of upwards of 15 per cent. Since 1890 the output of the Silesian coal carried by rail to these ports, increased by only 6 per cent.; but, on the other hand, the imports of British coal increased 65 per cent.

REGISTER OF PATENTS.

Gas Motor Engine.—Lanchester, F. W., of Alvechurch. No. 15,045; Aug. 9, 1895.

This invention has for its main object the construction of a gas motor engine of few moving parts in such manner that little or no vibration shall be communicated to any vehicle, or other structure to which the frame of the engine is attached; also to provide ready means of starting the engine without manual labour.

In one method of carrying the invention into effect, the patentee proposes to construct an engine comprising a piston working in a cylinder connected to a compression space in the usual manner, with valves and gear of any type. Instead of the usual single crank-shaft and connecting-rod, however, he arranges two crank-shafts to turn in opposite directions about a common axis; their respective bearings being arranged on opposite sides of the frame of the engine, and the crank-pins connected by two rods arranged side by side to a common pin fitted to the piston or crosshead. The cranks are of the overhung type; and each crank carries a balance-weight on the side opposite the crank-pin, and as near the centre line of the engine as possible. These balance-weights are arranged either to just balance the piston, connecting-rods, &c., or to somewhat overbalance them, in which case small compensating weights are arranged on the shafts at points remote from the centre line, but on the same side as the crank-pin. Fly-wheels of about equal weight are keyed on to the crank-shafts either inside or outside the bearings; and the balance-weights may be arranged as pieces cast on to the fly-wheels.

The action of this balancing arrangement (supposing the motor be of the horizontal type) is as follows: The approximately harmonic motion of the motor piston is compensated by the horizontal component of the circular motion of the balance-weights, the vertical components of which neutralize each other—the direction of motion being contrary. The object of this is to counteract any tendency to a rocking motion of the engine due to the planes of motion of the main balance-weights being slightly separated in order to leave sufficient space to accommodate the connecting-rods. When, therefore, an explosion takes place in the motor cylinder, an equal quantity of angular momentum is imparted to each of the fly-wheels in opposite directions; and consequently there is no unbalanced couple acting on the frame of the engine as is the case in gas-engines of the ordinary type.

In one mode of constructing starting gear in accordance with the present invention, the patentee encloses the crank chamber entirely in a sufficiently strong casing, and arranges thereon a gas injector and igniter such as is described in No. 5479 of 1890; the injector and igniter being so arranged on the casing relatively to one another that the crank chamber initially containing air can be charged with sufficient gas to form an explosive mixture, and ignition be effected in the manner described. The front edge of the piston is arranged to over-run a port in the cylinder wall when the piston is near its innermost position; this port opening to the atmosphere to allow the products of combustion to escape at the termination of the starting impulse.

Combined Tap, Bye-Pass, and Automatic Lighter for Incandescent Gas-Burners.—Duke, J. F., of Newington, S.E.; No. 15,359; Aug. 15, 1895.

This invention has reference to an adaptation to incandescent gas-lamps of the automatic igniters described in patents No. 21,032 of 1894 and No. 969 of 1895—that is to say, "igniters containing platinum black, which, when the unignited gas is caused to play upon it, becomes heated, and renders incandescent a platinum wire leading therefrom to a position near the outlet of the burner, the gas at the burner being thereby ignited by the incandescent wire."

The object of the present invention is to provide a device—comprising a tap, a bye-pass, and an automatic igniter—which can be fitted to an incandescent lamp by simply inserting it between the gas-supply pipe and the burner. The device is constructed as follows: In the shell or body of the tap is formed a bye-way leading from the gas-way to the exterior; and to this bye-way is connected a bye-pass pipe, which, when the device is in place, extends up to nearly the level of the burner. At the upper part of this pipe is a small gas-outlet; and near the outlet (in a position where the issuing gas will play upon it) is the automatic igniter. When it is required to ignite the burner, the tap is first partly turned, so as to allow gas to flow to the bye-pass pipe, but not to the burner. The gas issuing from the outlet at the upper part of this pipe plays upon the automatic igniter; and the platinum wire is almost immediately rendered incandescent, and ignites the issuing gas, which thus constitutes a pilot jet. The tap is then further turned, to allow gas to flow to the atmospheric burner, which then becomes ignited from the pilot jet. The supply to the bye-pass pipe is preferably shut off before the supply to the atmospheric burner is turned fully on.

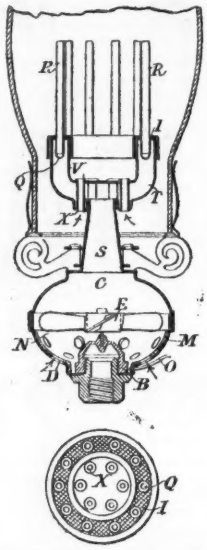
The tap is constructed with a groove in the side of the plug in such position, and of such length, as to communicate between the gas supply and the bye-way when the plug is partly turned on; while communication between the gas supply and the way leading to the atmospheric burner takes place through the main gas-way of the plug when the plug is further turned—the communication with both the bye-way and the atmospheric burner being closed when the tap is turned off.

Incandescence Burners.—Wheatley, W. H.; a communication from C. Schmid, of Brussels. No. 16,730; Sept. 6, 1895.

This invention in incandescence gas-burners consists: Firstly in the particular construction of the burner proper; and, secondly, in the composition of the refractory material of which the body to be rendered incandescent is constructed, and the process by which the material is prepared.

The gas issues through perforations in the burner nozzle B, in either vertical or inclined directions, into a mixing chamber C provided with perforations D for the admission of air; and thence through a turbine E mounted by means of an agate bearing-cap on a vertical pivot, so that, by the passage of the gas, it is caused to rotate. On the periphery of the turbine are mounted vanes or screw blades, which, when rotated by the current of gas, modify the flow of air into the

chamber, and thoroughly mix the incoming air with the gas on its way to the burner orifice I. The chamber C is divided at its centre; and inside the casing M is fitted a corresponding cup N coincidently perforated for the admission of air, and free to be rotated to a limited extent in order to regulate the admission of air, by an operating pin or lever O secured to the shutter cup N, and working in a short slot in the casing M.



The burner is of the argand type; the annular orifice being covered with wire gauze I secured by rings, and having short vertical tubular sockets Q placed centrally at suitable distances apart to receive the ends of the rods R of refractory material, which, on the ignition of the gas, become heated to incandescence, and thereby increase the illuminating power of the gas.

On leaving the chamber C, the gaseous mixture passes up the tube S, and through the annular burner chamber T to the burner orifice I. The annular chamber T is formed of an inner cup and an outer casing, secured together by tubes X, which also permit of the free passage of air to the central part of the burner.

The refractory material used for the rods R is composed "of either a mixture of magnesia and magnesium nitrate alone, or in combination with nitrate of silver, or any known refractory metals or earths, or salts or oxides of metals, other than silver." In forming the illuminant substance, "magnesia and magnesium nitrate are placed in a vessel, mixed with water, and ground or otherwise reduced to a pasty or creamy consistency, or mixed with other suitable metals or salts or oxides of metals, and then placed in moulds and burnt to the desired degree of hardness."

Gas-Engines.—Johnson, J., of Pembroke Dock. No. 18,379; Oct. 2, 1895.

In carrying this invention into effect, according to one modification the patentee provides an open-ended cylinder bore of two diameters; the inner cylinder, of smaller diameter, serving as the power cylinder. The outer cylinder is of larger diameter; and the piston working in this outer cylinder connects by a piston rod to the inner piston. The larger piston on the outstroke, moving outwards, creates a partial vacuum between itself and the smaller piston. This vacuum is utilized to charge the power end of the cylinder by first sucking out the exhaust gases left in the cylinder, and then drawing into the cylinder a charge of gas and air. The inlet gas and air valve is of a conical seated lift type; and the seat is provided with holes opening into an annular channel connected to the gas supply. Assuming that the piston moves out after compression and explosion, under a power impulse, then at the out end of the stroke it over-runs the first port controlled by a lift-valve opening outwards; and the cylinder discharges to atmospheric pressure through the lift-valve. On the further movement of the piston, a second port is uncovered, also controlled by a check-valve opening outwards. This port opens communication between the power side of the small piston and the side openings to the larger piston. At this position there is a partial vacuum existing in the space between the two pistons; and the exhaust gases at atmospheric pressure flow in from the cylinder into the space, while simultaneously the gas and air charge is drawn into the cylinder at the gas and air valve, and fills the cylinder to the desired extent. On the return stroke, compression of the mixture is accomplished; and at the termination of this stroke, the charge is exploded to produce the power stroke—the ignition being accomplished in any usual manner. During the return stroke, while compression is going on upon the inner side of the small piston, the exhaust gases are being discharged through the check-valves from the space between the larger and the smaller pistons.

Electric Gas-Lighting Apparatus.—Jahnsson, J., of Stockholm. No. 19,353; Oct. 15, 1895.

This is a modification of the arrangement of apparatus described in patent No. 3085 of 1895, so as to obviate a defect in the arrangement arising from the fact that, "in a lower guide of each lighter, a notch or cut of trifling depth was invariably followed by a deeply cut notch, and *vice versâ*, in such manner that, when the arms of the apparatus all occupied the shallow notches—*i.e.*, for lighting the burners—the transmission of an electric current brought them all into the deep notches, whereby, at once, all the burners were extinguished simultaneously. This might be somewhat embarrassing, when it is requisite only to light or extinguish a portion of the burners in a pipe-system."

In lieu of alternating the deep and shallow notches, two or more shallow notches may alternate with a single deep one, or *vice versâ* two deep notches with one shallow notch. In any event, however, when an arm falls into a shallow notch, the gas is turned on to the burner; but when the arm drops into a deep notch the gas is entirely turned off. In this way it becomes possible to extinguish or to light, at pleasure, a certain number only of burners belonging to the same pipe-system.

Gas-Enriching Apparatus.—Schroeder, G. G., of Washington, U.S.A. No. 7226; April 2, 1896.

This invention has for its main objects to provide an apparatus of simple construction for domestic use, whereby the gas may be caused to ascend through an oil sufficiently far to permit it to absorb enough of the oil to give it the desired degree of illuminating power, and yet so constructed and arranged that the amount of oil absorbed by the gas shall not be subject to variation, but shall remain about constant, however much the amount of oil in the tank may vary. A further object of the invention is to provide means whereby the apparatus may be quickly fed with the necessary amount of oil and purifiers, as those in the tank are being used up or rendered inefficient, or when the sponges become dry.

Gas-Engines.—Hockett, J. A., of Sterling, Kansas, U.S.A. No. 9770; May 7, 1896.

This invention relates to gas-engines arranged with two cylinders placed tandem, each with its component mechanism, and two pistons connected to a single crank-shaft, whereby an explosion occurs with each outward stroke of the piston. This permits a much lighter balance-wheel to be employed, and diminishes the weight of the engine in other particulars. Such construction embodied in traction engines, for instance, possesses great advantages over the ordinary steam traction engine for farming and analogous purposes, because of its comparatively light weight.

Regenerative Gas-Lamps.—Gordon, T., and Swift, W. R., of New York. No. 11,339; May 23, 1896.

This invention relates to gas-lamps for railway carriage lighting, employing a regenerative burner; and it has for its object to construct a lamp of that character which is said to accomplish three desirable results: First, to supply a constant air-current at the base of the lamp to feed the flame with sufficient oxygen; second, to enable the base of the lamp to be easily opened and closed, when it is desired to ignite the gas; and third, to enable the glass globe forming a combustion chamber, and also the exterior glass shade, to be so maintained in position as to be easily adjusted and held in position or be removed when desired.

Burners for Acetylene Gas.—Bauweraerts, E. F. J. C., of Brussels. No. 11,707; May 29, 1896.

The "characteristic feature" of this invention of a burner for acetylene gas is shown in fig. 1. The gas enters by the pipe H into the mixing chamber J, which communicates with the external air by means of two passages K extending obliquely from the bottom of the mixing chamber towards the outside. As the gas enters the chamber, air is sucked in through the passages; and an automatic mixing of the gas and air is caused thereby. The entry of the air may be regulated by the plate L, which (on rotation) closes the passages more or less. The plate is secured to the regulator-mixing chamber by screws and slots. Upon this "regulator-mixing chamber" is mounted the burner proper.

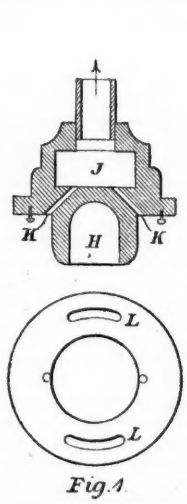


Fig. 1

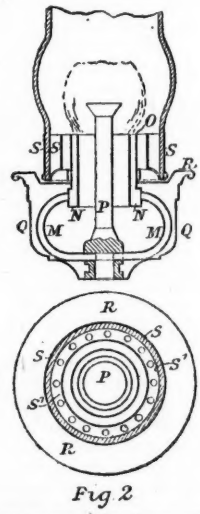


Fig 2

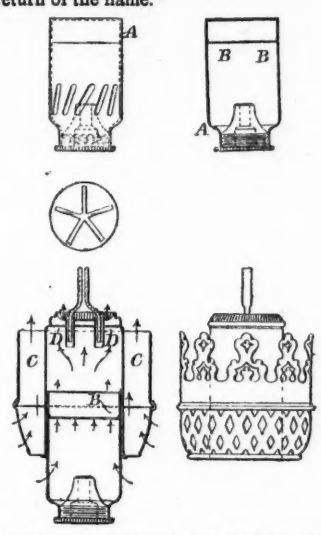
Fig. 2 illustrates a burner for producing an unconfined or unenclosed circular flame. Upon the pipe or passage situated above the regulator-mixing chamber are arranged—in the form of a cross—four semi-cylindrical branches M connected to a crown or ring N, above which is a circumferential chamber O, having an open top (or a top pierced with numerous apertures), so as to constitute the regenerator for the burner. In the centre of the burner, there is arranged a stem P, which widens out at its upper part in the form of a funnel. The acetylene gas mixed with air passes through the branches M, the ring or crown N, and the chamber O, where it is burned. The flame assumes a globular shape by reason of the upper part of the stem P, which terminates in a platform or plate, or in any other fashion, so as to impart the desired shape to the flame.

The casing Q is pierced with longitudinal apertures, and embraces the lower part of the burner. Upon this casing there is arranged a

gallery R, which carries a double ring S S¹. The glass chimney or globe is adapted to fit into the outer ring; while the space between the rings is pierced with numerous apertures. The air entering through the apertures of the casing is divided into two currents—one, the inner current, flowing along the stem P and along the internal surface of the flame; while the other, or outer current, is subdivided into two currents, one of which flows between the ring and the chamber O and serves to feed the flame on its outside, while the other flows through the apertures of the double ring and prevents the flame reaching the glass.

Incandescent Gas-Light Burners.—Boult, A. J.; a communication from the Compagnie d'Installation pour l'Eclairage et le Chauffage par le Gaz, of Bâle, Switzerland. No. 14,456; June 30, 1896.

These improvements consist, on the one hand, in the construction of the incandescent burner mixing chamber as a straight cylinder in one piece from top to bottom—that is, having no reduced or widened parts on the cylindrical circumference. The part of the burner constituting the gallery supports the chimney; and the bunsen tube proper has here (contrary to the custom adopted hitherto) the shape of an argand burner. The result is that the parts are wider and more spacious, and the diameter of the mixing chamber is larger. The object of the arrangement is to admit as much air as possible but at the same time, by placing in the mixing chamber several resistances or obstacles in the way of the rising gaseous column, to obtain "an extreme division and also a thorough mixing in the mixing chamber." A peculiarity in the arrangement of these obstacles consists in "the alternate arrangement of an obstacle or resistance in the shape of a very fine metal tissue or fabric causing an extreme division, followed by a resistance having the shape of a false bottom with crossed openings, which produce partial compression." The patentee calls the first partition "the soft resistance" and the second partition "the hard resistance;" and it is clear, he says, "that, by suitable arrangement, it becomes possible to modify or soften the ascending gaseous current on its passage to the flame to such an extent as will be found advantageous for obtaining a soft and powerful flame, without noise or danger of explosion or of return of the flame."



At top is an elevation, section, and plan of the tube comprising the first compartment of the mixing chamber and the nozzle through which the gas enters. The air passes through the holes in the cylindrical wall A, having the shape of longitudinal inclined slots. In the section is shown the inserted fine metallic fabric or tissue B, producing the first division of the ascending gaseous column. The top of the compartment is cut in the shape of a star; the radial slots allowing the passage of the rising gaseous column.

Below is an elevation and section of the burner and gallery. The gallery consists of a perforated lower part for admission of outer air to the flame, of an upper part on which rests the glass chimney, and of a central tube forming a second compartment of the mixing chamber. This tube C, fitting closely the tube A of the first compartment, has in its upper part a fine tissue or fabric, and is closed by a crown having the shape of a star, and provided at the circumference with radial cuts and two sheaths or sleeves for supporting two branches of the spring-armed holder for the mantle stem or support.

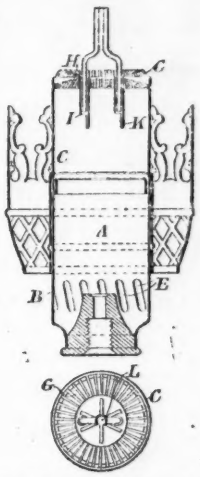
The gaseous mixture collects in the second compartment, from which it strikes against the "soft resistance" D, is again divided, and then escapes through the central apertures and circumferential ones. The arrows indicate the passage of the gas, air, and mixture of the two.

Incandescent Light Burners.—Mayer, M., of Hamburg. No. 15,167; July 8, 1896.

This invention in incandescent light burners has for its object "to produce an especially advantageous action of the mixture of air and gas on the exit of the same to the incandescent body."

The mixing chamber A of the burner consists of two tubes B and C slipped one into the other, the outer of which carries the burner gallery, while the inner tube (provided with suction inlet openings E for air) has screwed into it the base piece with a connection for the service gas-pipe. Into the upper part of the tube B, there is further inserted a perforated plate, the object of which is to obviate the disturbing noise of the upwardly passing gaseous mixture.

The closure at the top of the mixing chamber is constituted by a plate G with the underlying sieve H. The plate itself is of conoidal shape, so that it is composed of substantially vertical and substantially horizontal portions. The slits or perforations from which the gaseous mixture flows are provided partly in the vertical, and partly in the horizontal portion, with the result that the cone of gas is thereby caused to pass out of the plate in bell form having a strong outward bulge.



In place of the central socket, two side sockets I and K are inserted in the plate, for the purpose of receiving the forked foot of the support of the incandescent body. The centre of the plate thus left clear is provided with star-shaped apertures, which allow of the exit of the gaseous mixture.

APPLICATIONS FOR LETTERS PATENT.

18,673.—M'Caig, W., "Gas fires." Aug. 24.
18,757.—King, J. T., "Lighting and extinguishing gas-lamps." A communication from the Connelly-Critchlow Company. Aug. 25.
18,767.—Hart, G. W., "Gas motor engines." Aug. 25.
18,777.—Shaw, E. J., "Gas-lamps." Aug. 25.
18,782.—Koopmann, F. J., "Desulphurizing gas in the manufacture thereof." Aug. 25.
18,801.—Walker, S. S., "Gas buoys and beacon lights and other lamps." Aug. 25.
18,820.—Stevens, G., "Indicating the level of water in tanks at a distance, in combination with an alarm to prevent boiler explosions and waste of water." Aug. 25.
18,829.—Lanchester, F. W., "Igniting arrangements of gas and oil motor engines." Aug. 25.
18,835.—Potter, W. G., "Oil, gas, and vapour engines." Aug. 26.
18,863.—Holliday, T., "Making and storing acetylene." Aug. 26.
18,866.—Stone, J. H., and Atkinson, H. G., "Suspension of gas or other lamp shades." Aug. 26.
18,878.—Midland Purchase Syndicate, Ld., Gritton, W. H., and Whitington, W., "Gas-valves actuated by means of electrical energy." Aug. 26.
18,888.—Viard, E., and Geisenberger, E., "Generating, storing, and delivering acetylene gas." Aug. 26.
18,891.—Phillips, T., "Prepayment gas-meters." Aug. 26.
18,915.—Kosmann, B., "Separating certain rare earths, and manufacturing therefrom fabrics for use in incandescent gas lighting." Aug. 26.
18,956.—Gäbel, R., "Burners for gas and other lamps." Aug. 27.
18,992.—Chesnay, E., and Pillion, L., "Generating, storing, and delivering acetylene gas." Aug. 27.
19,044.—Villepigue, A. F. de, Fournier, V., and Shenton, G., "Extracting oxygen from the air." Aug. 28.
19,059.—Thompson, W. P., "Production of acetylene gas, and apparatus therefor." A communication from Daniel Hilaire Chivert. Aug. 28.
19,060.—Channon, P. P., "Pressure indicating apparatus." Aug. 28.
19,067.—Green, H., "Prepayment fluid meters." Aug. 28.
19,077.—Maxim, H., "Incandescence mantles for gas and vapour lamps." Aug. 28.
19,126.—Voigt, G., "Acetylene gas." Aug. 29.

An Order for Photometrical Plant for the Birmingham Corporation Gas Department has been placed with the newly-constituted firm of Messrs. Alexander Wright and Co., Limited.

Water Schemes for Small Towns.—Local Government Board inquiries have recently been held into applications by the local authorities of the places named for power to borrow money for carrying out water-supply schemes. At Machynlleth, £4700 is required for the purpose of constructing a reservoir in the neighbouring hills; at Semley, £1300 has been asked for to obtain an improved supply from a spring in the locality; and at Monkhesledon £1600 is wanted for procuring a supply from the Wingate Water Company.

Proposed Purchase of the Mid-Sussex Water-Works.—Last Wednesday, Mr. G. W. Willcocks, M.Inst.C.E:, held a Local Government Board inquiry into the application of Cuckfield Rural District Council for consent to purchase the Mid-Sussex Water Company's works. Mr. H. J. Robus, the Chairman of the Company, opposed the application. A prominent point was made as to the scarcity of water in the district, and the difficulty of getting the Company to lay mains where wanted. It was contended that under the local authority the capabilities of the water-works could be better extended, and the Company would probably be glad to be relieved of their undertaking at a price. It is over the figure to be paid that the real contention will arise; but the Chairman of the Company intimated that any fair and reasonable offer would be submitted to the shareholders.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Lord Rayleigh on Light.

SIR,—Two years ago, during the discussion that took place in the "JOURNAL" on the views expressed by me in my paper read at The Gas Institute meeting in 1894, I made a series of investigations on the illuminating power of different lights; and these led me to the conclusion that, besides the longitudinal or direct rays emanating from a luminous centre, there are transverse rays which have not hitherto been taken account of—in other words, that *there are rays from rays*.

I had prepared a letter to the "JOURNAL" setting forth my views on the question, but withheld it until I could more fully investigate the subject. Since then the matter has been in abeyance with me, as I have not had leisure to pursue the inquiry. At the time referred to above, however, I explained my theory to various gentlemen, gas engineers and others, who will no doubt have a clear recollection of what I stated.

The lectures by Lord Rayleigh, on Light, delivered at the Royal Institution, and reported in this week's "JOURNAL," fully confirm my views.

I am of opinion that it will be found on further investigation that the transverse rays are, both in number and luminosity, inversely as the intensity of the luminous central point. If this be so, it may help to account for the varying diffusive power of different lights.

THOMAS NEWBIGGING.

5, Norfolk Street, Manchester, Sept. 4, 1896.

Gas Enrichment by Benzol.

SIR,—The surprising advance in the value of benzol will doubtless cause some hesitation in continuing its use for carburetting gas. It should, however, be borne in mind that, beyond the intrinsic illuminating power of the benzol itself, its solvent action on naphthalene causes it to carry large quantities of that best of all enrichers with it in the gas, and, moreover, prevents its deposition in the gas-mains.

S. A. SADLER.

Middlesbrough, Sept. 1, 1896.

Mr. Damon and the Evans Photometer.

SIR,—In reply to Mr. Damon's letter, which appears in your last ssue, I beg to say that Mr. Damon entirely mistakes his position. The burden of proof does not rest with me, but with him.

I refer Mr. Damon to my first letter on the subject, which was published in the "JOURNAL" for July 28, and my offer made in that letter "that he might come and verify my results at any time he pleased." He has not chosen to do so. Therefore, unless Mr. Damon can prove that the tangible evidence I have put before him is wrong, the whole fabric of his assertions and innuendoes against the Evans photometer must fall to pieces.

Mr. Damon's remarks that the "construction of the Evans photometer is such that it is possible, by mechanical alterations, to both raise and lower the apparent value of the gas," is evidently puerile.

Mr. Damon's innuendo referring to the late Mr. F. J. Evans is not worthy of notice.

I do not question Mr. Damon's capability as a gas examiner; but as such, I do question his right to make any alterations—mechanical or otherwise—to the standard instrument placed under his charge.

WILLIAM SUGG.

Vincent Works, Westminster, S.W., Sept. 4, 1896.

SIR,—It is with reluctance that I ask for further space in the "JOURNAL" to enable me to say a final word in reply to Mr. Damon's letter in your last issue.

Mr. Damon commences by stating that the "Evans photometer is unsuitable for testing coal gas;" and then he pointedly insinuates, by way of innuendo, that this instrument was deliberately adopted by the late Mr. F. J. Evans, in his capacity of Gas Referee, for the purpose of benefiting the gas companies. It would be easy for me to show by actual facts that nothing could be farther from the truth. It will, therefore, be sufficient if I state that Mr. Evans was quite incapable of any "humbug" of this kind, Mr. Damon notwithstanding.

True it is that Mr. Evans did adopt this instrument for testing purposes; and I am convinced that it was then (and is now), in all circumstances, the most reliable instrument we have. If used as invented by Mr. Evans, it will give accurate results.

I would here point out that Mr. Evans held the office of Referee for a comparatively short period; and he instantly resigned when a slight reflection was made as to his impartiality.

Since Mr. Evans retired, the office of Gas Referee has been held by Dr. W. Pole, Mr. Vernon Harcourt, and Professor Tyndall, who have had full power to retain or discard this "unreliable instrument." But at the present moment the Evans photometer is in daily use at three-fourths of the stations in London, and all over the country.

So far from the Gas Referees having objected to the Evans photometer, on one occasion at least, they caused a photometer to be removed from an official testing-station, and substituted an "Evans." This instrument was, I believe, put up by Messrs. W. Sugg and Co.; and it gave every satisfaction. I ought perhaps to add that this change was recommended by the late Mr. T. W. Keates, the Consulting Chemist and Superintending Gas Examiner to the Metropolitan Board of Works, on the grounds that the "Evans photometer would better control the ventilation, and give more accurate results."

It is passing strange that, during the last quarter of a century, none of the Gas Referees should have discovered the unreliability of the Evans photometer nor found those "abnormal" results to which Mr. Damon refers; and that it should have been left to these later days for Mr. Damon to make the discovery.

The next sentence in Mr. Damon's letter is, to say the least, remarkable, in allusion to the Evans photometer: "Granting for the sake of argument that it may give correct results with proper surroundings, there remains the fact that it is possible, by *mechanical alterations*, to both raise and lower the apparent value of the gas. This alone is sufficient to condemn any photometer." With a *slight difference* I agree with Mr. Damon in this sentence. It is the "*mechanical alterations*" that should be "condemned," not the photometer.

The old Evans, under the conditions of "proper surroundings" (which presumably exist in all the testing-stations), will give fair results, in the hands of an impartial gas examiner of some skill. When these fair results are not found, they are caused by those "tinkerings," and "mechanical alterations" to which Mr. Sugg and Mr. Damon allude, and which have been so largely indulged in at Notting Hill, Hill Street, Tooley Street, and other places.

Mr. Damon is much exercised in his mind—and sadly perplexed—about the photometer in use at Dublin, upon which he obtained those awkward "abnormal results" to which he referred in his evidence given before the House of Lords Committee. He plaintively states, "that it is not an Evans photometer as invented by Mr. Evans"—the obvious inference being that had it been an Evans', the results would have been correct, and that no "artificial value" would have been given to the gas.

I ought to mention, Sir, that this (mutilated) Evans photometer was adopted only a year or two ago, as a result of arbitration, as the standard instrument between the Dublin Gas Company and the Corporation.

What Mr. Damon is "advocating is to do away with the already too varied forms that unfortunately now exist, and the adoption of a standard instrument which, with a reliable standard [I presume, of light], will give practically accurate results." Mr. Damon may possess himself in patience. His ideal instrument has yet to be found; and when Mr. Damon cries "Eureka," he will see a *vraisemblance* of the Evans photometer.

J. VINCENT TAYLOR, F.C.S.,
Twenty Years Gas Examiner to the Metropolitan Board of Works and the London County Council.

Sept. 4, 1896.

LEGAL INTELLIGENCE.

Damage to Public Roads by Contractors.

At Newent, Gloucestershire, last Saturday week, the Colchester Wemyss Company, Limited, of Mitcheldean, were summoned by the County Council for causing extraordinary damage to the road leading from Madam's reservoir to Newent. The damage was caused during the construction of a reservoir in connection with the Gloucester new water scheme. The Magistrates said their Clerk advised them that, on the evidence, they were bound to convict; and, by agreement, defendants were ordered to pay £233.

Conviction for Wasting Water.

At the last Bromley (Kent) Petty Sessions, Mr. E. S. Harris appeared to answer a summons charging him with wilfully and negligently wasting water supplied by the Kent Water Company. Mr. Alexander Dickson, the Secretary, appeared for the Company. Mr. Harris conducted his case in person; and, at the outset, he raised a technical point as to the validity of the summons, on the ground that neither the name of the complainant nor the name of the informant was given. This, however, was over-ruled; and defendant then pleaded not guilty. Mr. Dickson said the proceedings were taken in respect of the non-repair of certain water-fittings at 72, Newbury Road, Bromley, and a consequent serious waste of water which ensued thereon. The summons was issued under the Water-Works Clauses Act, 1863, section 17, which was incorporated in the Kent Company's Act of 1864. The defective apparatus was a water-closet cistern, the outlet valve of which was so seriously out of repair that, according to the evidence of the Company's witnesses, at least 100 gallons an hour in the day time was running to waste, and 20 or 30 gallons more an hour in the night time. At the rate of 100 gallons an hour, the loss would be 2400 gallons a day, or 158,000 gallons in the 66 days that the waste was going on—being equal to three years' supply to an ordinary house, estimated at 150 gallons a day, which the Company's Inspector said was a liberal allowance. At the rate of 25 gallons per head that was equal to a full day's supply for 6000 people. Mr. Dickson said he advanced these figures so that the Bench might fully appreciate the extent of the waste. Even in ordinary times, such waste was very serious; but in view of the recent prolonged drought, the offence was an aggravated one. The Company did not ask the Bench to inflict a fine upon Mr. Harris merely for the sake of recouping them for the £6 which was the value of the water estimated to have been wasted; but they asked the support of the Bench in the administration of a public water supply, so that the defendant and others might know that the Company's lawful notice for the proper repair of pipes, apparatus, and fittings, must be complied with within reasonable time, and so that large waste of this kind could not be allowed to go on. Mr. Harris made a statement in defence. He first of all put in an agreement between himself and the Company, entered into in 1888, by which the Company undertook to supply water to a number of cottages (of which 72, Newbury Road, was one) for £61 3s. 10d. per annum, instead of upon the true annual value of each house; and he contended that as the Company had contracted themselves out of the Act in one respect, they could not now enforce the penalty. Having criticized the construction of the cistern, he said his real defence was that he thought the work of repairing it had been done. He instructed a man to do some repairs to the house, as described by the tenant; and it was owing to his failure to repair the cistern that he was now summoned. The Bench convicted, and fined defendant £1 and costs.

Contemplated Gas-Works Extensions at Coventry.—Owing to the rapid increase in the demand for gas, the Gas Committee of the Coventry Corporation have under consideration the best means of augmenting the productive capacity of the works; it being estimated that an expenditure of £10,000 will be required. The question of the manufacture of water gas is being investigated.

MISCELLANEOUS NEWS.

THE LIVERPOOL CORPORATION AND THE GAS COMPANY.

The Irrepressible Alderman Smith.

Upon the presentation of the proceedings of the Lighting Committee at the meeting of the Liverpool City Council last Wednesday,

Alderman FREDERICK SMITH raised a debate as to a discussion which had taken place in Committee in regard to the Gas Company. He explained that a letter was read in Committee from the Treasurer of the Gas Company, announcing that the price of gas was now to be reduced to 2s. 9d. per 1000 cubic feet. Upon receipt of this letter, the Committee decided to write to the Company noting the reduction, but asking for the observations of the Directors upon the recent report of the Committee; while an amendment proposed by him (Alderman Smith) "that the Company be informed that the Committee do not consider the reduction sufficient owing to the reduced cost of coal," was rejected by eight votes to four. Alderman Smith now again moved his amendment, and made a long statement with respect to the relations of the Corporation with the Company. He complained that the latter had absolutely neglected to reply in any way to the statements contained in the report of the Committee; and as far as he knew, the receipt of the report had never been even acknowledged.

The TOWN CLERK (interposing) intimated that the receipt had been duly acknowledged.

Alderman SMITH (continuing) said he knew of no other gas undertaking that had not returned to the 1892 prices for gas. The reduced cost of coal justified such action; and yet the Liverpool Company, with all their peculiar advantages, were still charging considerably above the normal price. The amount of water gas made by the Company was worthy of consideration. If the technical papers could be believed, water gas could be made at something less than 1s. per 1000 cubic feet; and from an observation once made to him by the Solicitor of the Company, it was a fair inference to make that a considerable portion of Liverpool—if not not one-half—was supplied with water gas. Considering that the Company were still charging 2s. 9d. for this water gas, he asked the Council to say that the abatement of a penny was not sufficient to meet the case. He was aware of the strength of the gas interest in the Council; and he had no objection to the Company being handled kindly and tenderly if it resulted in concessions to the public. They were told that the value of residuals had fallen; but, on the other hand, they saw the Company sending their residuals, in the shape of coke, all over the country, and competing with other gas companies.

Alderman WILLIAMS seconded the amendment.

Colonel MORRISON remarked that they could sympathize with Alderman Smith's objects without being in the least degree enamoured of his method. The objects of the Alderman were to secure for the city a cheaper supply of gas, and in that they were entirely in sympathy with him. Unfortunately that desirable object had been rendered more distant by the methods Alderman Smith adopted during the time he was Chairman of the Lighting Committee. His present amendment showed a regrettable tendency to pursue the same methods which had inflicted very serious disadvantage upon the city.

Mr. HIGGINBOTTOM felt strongly that the Company were not doing for the ratepayers that which they ought to do. With the present price of coal, he considered they should have made a reduction in the price of gas of from 4d. to 6d. per 1000 cubic feet.

Mr. WOOD agreed with Colonel Morrison that the friction which had existed in times gone by between the Company and the Corporation was not conducive to the best interests of the gas consumers.

Mr. HARMOOD BANNER said the Lighting Committee had had an intimation from the Chairman of the Company that the Directors were considering their reply to the report of the Corporation, and that it would be forwarded in a very short time. Under these circumstances, the Committee thought it undesirable to express any opinion or to say anything that would make the Company consider they did not intend to meet them in a fair and reasonable manner.

Mr. J. LISTER, as one interested in the Company, said he would like to inform Alderman Smith that, in the sale of ammoniacal liquor alone, there had been a loss to the Company of £13,000. The price of oil, too, had risen so considerably in the last twelve months that the production of oil gas cost nearly as much as coal gas.

Mr. FLETCHER, on a point of order, inquired whether Mr. Lister, who was a Director of the Company, was entitled to discuss the matter.

The LORD MAYOR said the matter must be one for the individual conscience of the member. The Municipal Corporations Act provided that a member of the Council should not vote or take part in the discussion of any matter before the Council in which he had by himself or his partner any pecuniary interest.

Mr. LISTER: Then I am disqualified.

On a division, the amendment was rejected by 27 votes to 17.

THE PRICE OF GAS IN THE MANCHESTER OUT-TOWNSHIPS.

At the Meeting of the Manchester City Council last Wednesday, Alderman Gibson, the Chairman of the Gas Committee, moved the approval of a proposal of the Gas Committee that the price of gas in the out-townships be reduced 3d. per 1000 cubic feet from the 29th inst. He gave three reasons for the Committee's recommendation: First, because it was just and proper; secondly, because the Committee considered it expedient; and, thirdly, because they knew they could afford to do what was proposed. Dealing with the last proposition first, he compared the position of the Gas Department with what it was five years ago. In 1892, the value of the works and plant was £1,470,000; and in 1896, it was £1,117,304. In 1892, their indebtedness was £681,582; and in 1896, it was £876,107. The crucial point, however, was their actual position. In 1892 their assets over their liabilities were £865,000, and in 1896 they were £943,000; so that in the five years they had improved their position to the extent of £78,000. The satisfactory position in which they stood was in some degree, of course, owing to cheaper coal; but it was also in part due, he claimed, to the good management of the Committee. In 1892 they had 80,571 customers, while in 1896 they had 87,242. This increase was to be accounted for partly by reason of the provision of "penny-in-the-slot" meters, and partly in consequence of the last reduction in the price of gas. Of the total increase, the prepayment meters probably accounted for 2500 customers. The charge for meters was only justified on grounds of expediency. The proposals he now made meant a loss to the Committee of £8000 a year; but his judgment and experience led him to the conclusion that they would get that amount back in a very few years. He had always believed in a broad and generous policy; and he was assured that such a policy as he now proposed would lead to an enormous increase in the prosperity of the undertaking his Committee controlled. Alderman Higginbottom seconded the motion, which was opposed by Mr. Greenhow, who did not think the time was opportune for making the proposed reduction. An amendment was moved by Mr. J. W. Southern, that the proposed reduction be deferred, and that an amount represented by the reduction be set aside for special improvements in the neighbourhood of the gas-works. In his opinion, the Council considered the out-townships to a degree altogether undeserved. Sir B. T. Leech seconded the amendment. As a resident outside the city, he did not think the price of gas was excessive; and, indeed, outsiders benefited so largely by the city that they could well afford to pay a little more for their gas. Among other speakers was Mr. Royse who said there was not a single township that could manufacture gas at the price at which it was now sold to them by Manchester; and no reasons existed for the reduction. Alderman Higginbottom pointed out that, if the Committee were not working under an old Act of Parliament, they would be unable to make any distinction at all in the price charged to their customers. It must be borne in mind also that there was a movement for the promotion of a joint scheme on the part of a number of townships now consuming Manchester gas to supply their districts with the electric light. He did not hold the view that it was impossible for small districts to produce gas at as low a cost as Manchester. Alderman Mark approved of the policy of the Gas Committee, which was to supply their customers with the best article they could at a fair profit. Mr. Southern modified his amendment; so that it merely deferred the proposed reduction for the present. In this form it was passed.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Ordinary General Meeting of this Company was held last Saturday week, at the Offices, Willoughby Lane, Tottenham—Mr. CORBET WOODALL presiding.

The SECRETARY (Mr. J. Randall) read the notice calling the meeting; and the report and accounts, of which the main features were published in the "JOURNAL" for the 18th ult., were then presented.

The CHAIRMAN, in moving the adoption of the report and accounts, first referred to the absence of the Chairman of the Board (Mr. George Gripper), who, not being very well, had, by his doctor's advice, gone to Buxton. There were, proceeded Mr. Woodall, one or two points, with regard to the report and accounts, which, he thought, fairly called for some little observation. The Directors had found it necessary to draw a small sum from the reserve fund, in order to pay the dividends which they were advising the proprietors to declare. The amount, as he said, was small; but it was an unusual circumstance in connection with the Company. They had earned about £2200 less than was required to pay the dividend; but this was met partly by very nearly £2000 brought forward as an undivided balance from the previous half year, and the remainder was taken from the reserve fund. While they were taking from this fund £192, they were adding to it £218 of interest; and to the insurance fund, £44. So that the reserve fund would not be actually reduced by the amount they had taken for the dividend. The reason they had not earned the dividend was really on the surface. In the first place, they had reduced the price of gas; so that they had been receiving 2d. per 1000 cubic feet less than they did in the corresponding period of last year. The value of this reduction represented about £900 in the half year. In addition to this, they had altered the time of taking the indices of the meters. They were usually very late with this; so that it became difficult to get the accounts prepared ready for the meetings. They had consequently altered the date at which they took the meter indices—making it earlier; and in this way they had reduced the receipts for the past half year. Of course, the consumers' accounts for the half year would also be short; and he was afraid they would find them proportionately heavy in the half year to come. The value of the gas that would otherwise have been brought into account this half year, and which was not so brought in, in consequence of this change, was more than £900. This and the reduction in price represented broadly the deficiency in the profits. In addition, they had had a very considerable reduction in the receipts from coke and sulphate of ammonia. This amounted to nearly £500; and he was afraid there was no prospect whatever of any material increase in these items. Still there was absolutely nothing to be concerned about in the fact that they had to draw upon their reserve to pay the dividends. The Directors were satisfied as to the wisdom of the course they took in reducing the price of gas; and they confidently looked forward to the time when they would again be enabled to make a further concession to the consumers. The report mentioned that there had been an increase of 3·96 per cent. in the quantity of gas sold. As a matter of fact, they made and sent out 12 per cent. more than they did in the corresponding half of 1895; and the Directors believed this was without parallel in the experience of London and Suburban Gas Companies. This time last year they were dealing with accounts for a half year in which the weather had been phenomenally favourable to gas companies—exceptionally cold and dark weather—and in which they all recorded a large increase in their consumption. But the half year with which they were now

dealing had been one of exceptional mildness; and yet on the enormous increase they had a year ago, they had now to report a further rise in the consumption of 12 per cent.—the difference between the 3·96 per cent. mentioned in the report and the 12 per cent. being explained by the earlier taking of the meters. This considerable addition to their business was nearly all due to the adoption of prepayment meters. It was almost alarming the way in which this system was progressing. After the fifty years of the Company's life and growth, they had only 5764 ordinary meters; while they had fixed, since they introduced them three years ago, 3387 automatic meters! The increase in cooking and heating stoves was also remarkable, and eminently satisfactory. Altogether the position of the Company was undoubtedly bright and promising, as it ever had been. Some of the proprietors had probably heard some talk of introducing the electric light into the district. For his own part—and he was speaking simply his own personal opinion there—he had little doubt the electric light would be introduced. There were places and applications in and for which the electric light was suitable; and it was a pity would-be consumers wishing to pay for it should not have it. He might say on behalf of the Company, that if it were felt to be a real necessity in the district and a demand for it grew, the Directors would not hesitate to ask the proprietors to approve of the Company undertaking the supply of the electric light, if they could make terms with the local authorities, and obtain the necessary powers. The Directors had absolutely no feeling in regard to the electric light, except this, that they were satisfied, if it was to be supplied in the district, they could furnish it at a lower rate than anybody else; and they had no objection at all to being a Lighting Company, instead of exclusively a Gas Company. He might say with regard to the installation of carburetted water gas that it had proved a very satisfactory success. The illuminating power of the gas supplied had been maintained with greater ease, and at a somewhat higher standard than before; and they were enabled to make a better quality of gas at a fair reduction, as compared with the lower quality they previously produced from coal alone. There had been an increase in the cost of oil during the half year—due chiefly he believed to some troubles in the oil district in Russia. There they had had very severe and bad weather; the railway had been washed away; and consequently the transport of oil had been very difficult. The price of oil had therefore been somewhat higher than in the corresponding half of last year; but, on the other hand, they had charged less for coke to the manufacture of water gas, because they were now getting a lower price for that residual. So that, taking the oil and coke together, the cost would be almost the same as in the previous half year.

Mr. J. WARREN seconded the motion, which was at once unanimously carried.

On the motion of Sir H. CARTWRIGHT, seconded by Mr. E. CROWNE, dividends at the rate of 11¼ per cent. per annum on the "A" stock and 8½ per cent. on the "B" and "C" stocks were declared.

The retiring Directors (Messrs. Corbet Woodall and Warren) and the Auditor (Mr. G. T. Watson) having been re-elected,

A vote of thanks was passed to the Chairman and Directors, the Auditors, the Secretary, the Engineer (Mr. W. H. H. Broadberry), and the staff.

Mr. H. D. ELLIS (in the absence through illness of Mr. E. Sawyer, who had given notice of the motion) then moved that the salary of the Secretary, Mr. Randall, be increased by £50 per annum from July 1 last. In the course of a few remarks, he said that Mr. Randall had been in the Company's service for a great many years; and during this time the proprietors had always experienced the utmost courtesy and attention from him. Going beyond that, there was the more serious question of the manner in which he had performed the duties of his office; and that was a matter which was peculiarly known to the Directors. He had discharged them to their entire satisfaction; and the motion he (Mr. Ellis) now submitted had their hearty concurrence and support. It had been felt by many of the proprietors that it was a fitting thing they should now show their appreciation of the long and faithful services Mr. Randall had devoted to the Company, which he had seen grow up from small beginnings to its present considerable proportions.

Mr. NOWAKOWSKI seconded the motion.

The CHAIRMAN expressed the hearty approval of the Board in the resolution, which was then unanimously carried.

Mr. RANDALL cordially thanked the proprietors for this renewed mark of their appreciation of his services, and said he hoped he would long continue to have the honour of serving the Directors, and through them the proprietors. He was sure the Company had not yet reached the end of their tether. They had still 20,000 more small houses they could supply with gas by automatic meters; so that there was a good future before them.

The proceedings then terminated.

Water Supply in South Africa.—A Reuter's correspondent states that the Transvaal Volksraad yesterday week approved of what is known as the Wonderfontein scheme of water supply for the Rand. The Government will pay £20,000 per annum as a guarantee out of the State revenue, and will make up any deficiency in the interest of the Company undertaking the scheme. The water supply is said to be unlimited, and of the best quality.

The Proposed Purchase of the Deal Water-Works.—The Walmer District Council, after many meetings and lengthy discussions, have at last passed a resolution in favour of joining the Deal Town Council in a scheme to purchase the Deal Water-Works for the purpose of carrying on the same under a Joint Water Board. Whatever decision the Walmer Council arrived at, the Deal Corporation had resolved to proceed with the preliminaries precedent to the purchase; so it dawned on the Walmer authorities that, much as they objected to being in a minority on the Joint Board, it would, under the circumstances, be better to "take the half loaf," as by refusing to do so they would in the end be entirely at the mercy of the Deal Corporation in respect of the water supply, unless they established separate works, for which they would, of course, have to get parliamentary powers.

HARTLEPOOL GAS AND WATER COMPANY.

The Jubilee Meeting.

The Annual and Jubilee Meeting of the Hartlepool Gas and Water Company was held on Monday last week—Mr. W. H. FISHER, J.P., presiding.

The SECRETARY (Mr. Thos. Trewhitt) presented the annual report, which stated that, though there had been an increased quantity of gas sold, there was a decrease in the net revenue, arising partly through a reduction of 1d. per 1000 cubic feet in the price of gas, but principally through the unprecedentedly low value of sulphate of ammonia. The water revenue showed a satisfactory increase, notwithstanding the long drought, which had caused much inconvenience and some loss to the Company. The Directors recommended the payment of dividends of 10, 7½, and 7 per cent. per annum on the various classes of shares, which would leave a balance of £1273 to be carried to the next account. The report also stated that it had been found necessary to increase the gas purifying plant by the erection of an additional purifier, now in course of construction, and also to increase the storage for soft water at Hurworth Burn. The Directors congratulated the shareholders upon the Company's prosperity in this year of its Jubilee—the first Act having received the Royal Assent in June, 1846.

The CHAIRMAN said it was again his pleasure to present a satisfactory report; and he thought all the shareholders would agree that it was the best they had had for some years in that the maximum dividend had been reached. The report was very satisfactory; but it might have been still more so had they not made a reduction in the price of gas and increased the discount on gas consumed for motive power. There was also the unprecedented reduction in the value of residuals, especially sulphate of ammonia. There had been an increase of 3 per cent. in the quantity of gas made, as compared with the previous year; the total amount manufactured having been 306,949,800 cubic feet. The gas revenue from all sources was £63,055, compared with £62,297 in the previous year—an increase of £758. The gross expenditure had been £34,264; being a decrease of about £600 on last year. The consumption of gas had considerably increased; and they had also received benefit from the growing use of cookers—the total number on hire being 561, or an increase of 33 in the year. Another source of revenue was the automatic meters, which, he was glad to say, were now in working order. They were proceeding with the fixing of these meters as fast as they could; but consequent on the demand for them all over the country, the manufacturers were unable to produce them fast enough. The number of meters of this class in use in the Hartlepools was 402. They had only recently commenced to fix them; and so they had only had the benefit of them for about three months. The water supply had increased very satisfactorily. The supply for business purposes had been 394 million gallons, or an increase of 34 millions; and for domestic purposes, the consumption had been upwards of 664 million gallons, being an increase of about 18½ millions. It was, he added, the Jubilee Year of the Company. It was formed in 1846, with a capital of £18,000. The capital at the present time was £500,000, of which £463,590 was paid up. The price of gas in 1846 was about 6s. 8d. per 1000 cubic feet; and now, in 1896, it was 2s. 5d., less a large discount. During the year, the Directors had found it necessary to sell further shares; and the shareholders would have noticed that the sale was a satisfactory one. The premium had now reached 100 per cent., or slightly more; for at the sale some £10 shares realized £20 0s. 6d., and he believed in the market they were quoted at £20. This showed that the Company stood well in the eyes of the investing public.

The report was adopted; and the dividends recommended were declared.

At the conclusion of the proceedings, the Directors and shareholders dined together at the Royal Hotel.

In an article on the "Jubilee" of the Company, the "Newcastle Chronicle" furnishes some additional particulars as to the growth of the concern; and the following are extracts therefrom: In 1846, an Act was obtained; the Company was formed; and it bought the old gas-works previously the property of Mr. J. A. West, who was long the Chairman of the Company. These works had supplied Hartlepool with gas from about 1836; and they are the nucleus from which the vast works of the Company have sprung. The Act of 1846 was deemed deficient; and in June, 1849, the Royal Assent was given to an amending one—enabling the Company to bring water from a spring "issuing from magnesian limestone, in a quarry near Mill House, at Stanton." This supply, enlarged as time has gone on, has proved to be sufficent for the needs of a population that has increased by a thousand a year ever since. In the days when the Company was formed, the town of West Hartlepool was barely begun; but the docks were in course of construction, and the area of supply was not only the old borough of Hartlepool, but also Hart, Middleton, Stanton, and Seaton Carew. This area has been since enlarged; and by a lavish expenditure of money and energy, the Company have been able to meet all the needs for water and gas of a population that has grown more rapidly than that of any other in South Durham. The service that the Company render to their customers may be briefly stated in figures that will well illustrate the growth of a great community, though the facts are only available for a portion of the half century now completed by the Company. The capital called up in 1869 was £141,424, and in 1896 £461,058. In 1869, the highest dividend paid on any section of the shares was 6 per cent. per annum; but for the half year ending with June last, the highest dividend allowable has been paid at the rate of 10 per cent. per annum on the "A" shares. The early reports do not give us details of the exact amount of gas produced; and the fact that part of the sales are under contract, and not by absolute measurement, prevents a comparison. But it may be said that in the last fourteen years the sale of gas by meter has nearly trebled; while the price has been reduced from 3s. 4d. to 2s. 5d. per 1000 cubic feet, less discounts. The quantity of gas made in the past financial year was 306,949,800 cubic feet. The revenue from gas—apart from residuals—was in 1869, £10,464; and for the year ending in June last, it had risen to £33,211. The Company give

a twofold supply of water—one for domestic purposes, and the other brought from a distance for business uses. In 1862, about 152 million gallons of water were supplied for domestic purposes; and in nine years the quantity was about doubled. The amount used for business and manufacturing purposes rose from 24 million gallons in 1862 to eight times that volume nine years after. In 1871, the supply of water for both purposes was approximately 495 million gallons; and for the past year, it had risen to 1058 million gallons. To meet the needs of the growing community, there has been a frequent enlargement of the gas producing and storing power, and the addition of plant for working up some of the crude residuals. The original springs that gave the domestic water supply have been increased; and for the business needs large reservoirs have been formed. In the works for the production and distribution of gas, there is now invested £221,000; and the water-works have entailed an expenditure of £241,000. For about a dozen years, the Company has been under the able chairmanship of Mr. W. H. Fisher; and for more than thirty years, Mr. Thomas Trewhitt has been the efficient and experienced Secretary.

OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, 9, Queen Street Place, E.C.—Colonel James Le Geyt Daniell (in the unavoidable absence of the Chairman, Mr. A. J. Dove) presiding.

The Secretary (Mr. T. Guyatt) read the notice convening the meeting; and the report and accounts to which reference was made in the "Journal" for the 25th ult., were taken as read.

The Chairman, in moving the adoption of the report, said that, comparing the revenue account with that for the corresponding period of last year, it would be found there was very little alteration. Under the head of lamp lighting, there had been a small increase, owing to all the lamps in Smyrna having been repaired and put into good order. The item of depreciation, renewals and repairs had been somewhat less, owing to the fact that in 1895, a larger sum was charged for retorts than in the past half year. The rental from public lights (£3752) and general consumers (£4877) showed a slight decrease; and there were also small reductions in the other items of revenue. These decreases did not necessarily indicate a falling off in business; but nevertheless they were the subject of inquiry on the part of the Directors. He added that the public lighting contract had been renewed for a further period of five years.

Mr. Stephenson R. Clarke seconded the motion, which was unanimously carried.

The Chairman next proposed that £1000 be added to the reserve fund (making it £10,000), and that a dividend of 7 per cent. per annum, free of income-tax, be declared on both classes of shares.

Mr. Charles Gandon, in seconding the proposal, remarked that, although the position of affairs was perhaps not quite so favourable as in the corresponding half of 1895, yet they might accept the accounts as fairly satisfactory, seeing that the Directors were able to pay the usual dividend and put a considerable amount to the reserve fund, which was strengthening the Company to a very considerable extent.

The proposition was agreed to.

A resolution was also passed, on the motion of Mr. W. Hughes, seconded by Mr. J. L. Chapman, thanking the Directors for their careful attention to the Company's affairs. Acknowledgment was also made of the services of the Consulting Engineer (Mr. H. W. Andrews), the Engineer at Smyrna (Mr. John Gandon), and the Secretary.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The Directors of the British Gaslight Company, at the half-yearly meeting on the 30th inst., will recommend a dividend at the rate of 10 per cent. per annum for the half year ended June 30 last, with a bonus of 2s. 6d. per share.

In the course of their half-yearly report, the Directors of the Cheltenham Gas Company express their gratification that the points of difference between the Town Council and the Company have been settled, and that their Bill passed through Parliament unopposed. The provisions for converting the various stocks raised under former Acts into an equivalent amount of 5 per cent. consolidated ordinary stock will, it is mentioned, be acted upon in due course. Dividends at the full statutory rates have been declared for the past half year.

On Monday of last week the annual meeting of the Cradley Heath Gas Company was held—Sir Benjamin Hingly, Bart., presiding over a good attendance. The annual report submitted by the Secretary (Mr. Charles Dakin) congratulated the shareholders upon the satisfactory position of the undertaking. The consumption of gas during the year had been increased by about 41 per cent. compared with the previous year; and it also showed an increase of 30 per cent. over the sales in any other twelve months. To meet this increased demand, the Directors had found it necessary to make several important alterations and extensions to the manufacturing plant, which included the substitution of larger mains through portions of the district, in place of old ones which had become too small. This had involved an additional expenditure; but notwithstanding the outlay, there was a profit upon the year's working of £2011, after providing for interest upon debentures. The report was adopted; and it was decided to declare dividends of 10 per cent., 7 per cent., and 4 per cent. on the respective shares. It was mentioned that the capital of the Company as authorized by Special Act of Parliament was exhausted; and it was decided to apply to the Board of Trade asking for a Provisional Order to increase the capital.

The half-yearly meeting of the Douglas Gas Light Company was held yesterday week. It was reported that the net profit of the half year was £3484, which was £120 better than the corresponding period of last year. The amount available for division was £5064; and the Directors recommended a dividend of £1 10s. per share. The report was adopted; the dividend declared; and £500 was transferred to the reserve fund.

The Directors of the Gloucester Gas Company report that the quantity of gas sold during the past half year shows a falling off as compared with the corresponding period of 1895, owing to the exceptional mildness of the season, and to the unfortunate epidemic which existed in the city in the half year, and which has now happily passed away. The revenue from coke has also largely diminished; but that from tar has satisfactorily increased. Notwithstanding the decreased revenue, the net profit, after providing for interest on mortgages, &c., amounts to £4613. The usual dividends will absorb £3928; leaving a balance of £665 to be carried to the next accounts. With a view to extend the use of gas, the Directors have adopted the prepayment meter system; and though only recently introduced, there are evidences that it will be widely taken advantage of.

The shareholders of the Lewes Gas Company met last Thursday to receive the report of the Directors upon the trade of the half year to June 30 last. The profit, it stated, amounted to £1551; and after providing for interest on loans, the balance of net revenue, as shown in the profit and loss account, was £1932. Dividends of 5 and 3½ per cent. for the six months were recommended, the payment of which would absorb £1383. In moving the adoption of the report, the Chairman (Mr. James Broad) said that, owing to the mildness of the past six months in comparison with the gloomy and severe weather prevailing in the corresponding period of 1895, the receipts for gas were £80 less, in addition to which the returns from residuals had diminished by £200. Their Manager (Mr. Levi Monk) had, however, effected certain savings which more than counterbalanced these losses. In connection with prepayment meters, there had been a very large increase of business. In the December half of 1894, they sold through these meters 21,800 cubic feet of gas; while in the past half year the consumption under this system had been 623,000 feet. On the 30th of June, there were 120 of these meters in use. General gratification with the position of affairs was expressed by the shareholders; and the report was adopted.

Speaking of the working of the past half year at the recent meeting of the Richmond Gas Company, the Chairman (Mr. T. J. Carless) stated that, comparing the figures with the June half of 1894, there had been an increased sale of 3 million cubic feet of gas. In common, however, with other gas companies, they had suffered from the serious depreciation of the market value of coke and sulphate of ammonia; and at present they could not see any prospect of a return to the old values. The price of coal was about the lowest on record; and their contracts would continue another year. They had supplied and fixed some 500 automatic meters and fittings; and orders still continued to be received. To meet the dividend, they had to draw £1500 from their undivided profits, which would leave £2659 to be carried forward, and which, added to the reserve fund, made a surplus of £8100. Turning to the capital account, he said the expenditure of £1466 in the half year had been the result of the growing demand for gas on the automatic system, and the appreciation of gas for cooking; nearly £300 having been spent on new stoves. As to the revenue account, coal had cost £538 less than in the corresponding half year, owing to the mild winter and spring; and to the same cause must be attributed the falling off in consumption of gas compared with the large figures of the corresponding period of last year, when the weather was exceptionally severe. The business, however, was in a healthy and sound condition, as was shown by the growth of meter-rents; a large number of new consumers having been added during the half year. Residual products had drooped in a most alarming manner; there being a total decrease of close upon £900, or more than equal to a charge of 2d. per 1000 cubic feet in the price of gas. The balance of profit and loss account amounted to £6640, which, as he had already intimated, would allow of the payment of the usual dividends, with £2660 to carry forward. The report and accounts were adopted; and, before the proceedings concluded, the Chairman and Directors and the Engineer and Secretary (Mr. T. May) were heartily thanked for their attention to the interests of the Company.

The report of the Directors of the Rugby Gas Company show an income for the half year to June of £6069, and an expenditure of £4935; leaving a balance of £1134 to be carried to the profit and loss account. An interim dividend for the six months at the rate of 12 per cent. per annum, free of income-tax, is to be paid.

The Chairman of the Sunderland Gas Company (Mr. J. Stokoe, J.P.) in addressing the shareholders at the recent annual meeting, made some interesting comparisons of the figures for the past year with those of the preceding one (*ante*, p. 424). With regard to the revenue account, he said the make of gas had increased by nearly 7 million cubic feet; and mainly in consequence of this £787 more had been paid in wages. Coal, lime, &c., had cost £2461 less; while repairs were £1100 more. There were also small variations on that side of the accounts. On the other side, the gas and meter rentals had increased by £1063. The profit for the year was £17,214; and the maximum dividend would require £14,372—leaving a balance to carry forward of £2842. With those figures before them, the shareholders would, he thought, be very much rejoiced at the condition of affairs. But there was one matter which was not quite so pleasant, although it did not make a great deal of difference to them—that was the total decrease, owing to the reduction in the price of residuals, was £1270. Their Secretary (Mr. J. H. Cox) had furnished him with some figures of great interest. These showed that gas was first made in Sunderland in 1824. The first Act of Parliament was obtained by the Company in 1846; so this was what they might call their Jubilee Year. They asked for a capital of £32,000; and their present capital was £190,600. The price of gas just previous to the establishment of the Company was 10s. per 1000 cubic feet, less discount; now, and for some years past, it had been 2s., less discount. Coal in the good old times was bought by the chaldron by the large consumers; and in 1848 or 1849, it was 2s. 11d. a ton, while now it was 6s. 7d. The population in 1846 was 50,000; and at the present time it was estimated at 135,000. The report was adopted; and dividends of 5 per cent. on the original stock and 4½ per cent. on the additional stock were declared for the half year.

The annual meeting of the Tamworth Gaslight and Coke Company

was held on the 26th ult., when the Directors reported a profit for the twelve months' working of £1215, out of which they proposed a final dividend for the year of £1 on each old share, and 14s. on each new share, less income tax. The exceptionally mild winter of 1895-6 had operated somewhat prejudicially against the consumption of gas; the sales for 1895-6 being 21,464,000 cubic feet, against 21,319,000 cubic feet for 1894-5—showing a slight increase. The new purifiers and house were completed and paid for, and working to the complete satisfaction of the Directors. The extensions and the specifications for the work were carried out by the Manager, Mr. Walter A. Sapey. The Directors were pleased to note the extending use of the penny-in-the-slot meters; about 80 having been issued during the year—nearly all to new consumers. Accompanying the report was a prospectus announcing a further issue of new shares, which had been rendered imperative owing to the increased size of the works, and the business. When the present Directors accepted office in 1891, the sales of gas amounted to 16,420,000 cubic feet for the year; and the total share and debenture capital, including premiums was £16,539. The sales of gas for the year ending June 30, 1896, were 21,464,000 cubic feet, or an increase of 301·7 per cent. in five years; while the new capital of £1596 (including premiums), only represented an increase of just over 9½ per cent. The report was adopted; and the usual formal business was thereafter transacted. A very lengthy discussion took place on the invitation of the late Chairman of the Company, Mr. W. Arnold, who again called in question the policy of his successors in office and the other members of the Board. According to a local report, Mr. Arnold criticized the method adopted by the Directors of presenting the annual accounts; but his statements were replied to by Mr. Hill, a Director, and Mr. Arter, the Auditor, in such a manner as to so satisfy the shareholders that the accounts were passed. "At previous meetings of the Company (says a contemporary) Mr. Arnold has also assumed the *rôle* of the candid critic, and the proceedings, like those of Wednesday, have consequently been invested with less of the hum-drum character which usually distinguishes the meetings of companies paying fat dividends regularly. Still the relations between Mr. Arnold and the directorate are a purely domestic concern for the shareholders, although the general public love to look on, and Irish-like, do not care to 'spoil a good fight.' They do not really affect the policy of the Company in its dealings with the public—that is, with consumers of gas. That policy, it is fair to say, is broad-minded; and its guiding principle is to supply gas at a cheaper price, and such as is consistent with the interests of the shareholders."

The Waltham Abbey and Cheshunt Gas Company held their half-yearly meeting on the 28th ult. The Directors were able to report that, in the first six months of this year, the revenue from gas supplied was well maintained; and the recent expenditure on renewal of mains had effected a substantial reduction in the amount of gas unaccounted for. There was however again a serious falling off in the receipts from coke and ammonia. The Directors recommended dividends of 7 per cent. on the original, and 5 per cent. on the additional capital. These, together with debenture interest, would require £1070, and leave £789 to be carried forward. The recent sale of £1250 of "C" share capital realized £1447 or a premium of £197; while during the current half year a first issue of £3150 of 4 per cent. debenture stock—partly in substitution for expired debentures—had been successfully disposed of, at an average price of £123 14s. 2d. per £100 of stock. The works and mains (under the control of Mr. W. B. Randall, the Company's Manager) have been maintained in a condition of thorough efficiency.

The half-yearly report of the Winchester Water and Gas Company shows receipts on revenue account of £10,255, while the expenditure came to £6480—leaving a balance of £3775 to carry to the profit and loss account, and bringing the total under that head to £5297. On the recommendation of the Directors, it has been resolved to pay a dividend at the rate of 10 per cent. per annum (less income-tax) on the original capital, and 7 per cent. on the capital which has been recently created by the issue of 120 shares. The principal increase has been in the sale of gas, which amounted to £850 more than in the corresponding half of last year. The Company are having a water-gas plant erected at their works, which is expected to be ready before the end of the year.

Water Companies.

The net revenue receipts of the Brymbo Water Company in the year ending June 30 amounted to £1429, of which £750 was absorbed in the payment of an interim dividend and the interest on the debentures. From the balance, a dividend at the rate of 2½ per cent. per annum is to be paid. The Company are constructing a reservoir at Pendinas; and it is expected that it will be completed in about nine months. Its approximate capacity will be 90 million gallons.

The Directors of the Chichester Water-Works Company, in their half-yearly report, state that the receipts for water-rents during the last three half years have been as follows: June, 1895, £1393; December, 1895, £1399; June, 1896, £1402. The profits for the past half year amounted to £976; and dividends are proposed of 8s. per share (free of income-tax) for the half year, which will absorb £800.

The receipts of the Dorking Water Company in the six months to June 30 amounted to £1390; and deducting expenses, a profit of £939 remained. After paying the interest on the mortgages, and adding a small sum brought forward, there was a disposable sum of £885. Out of this an interim dividend at the rate of 5 per cent. per annum is to be paid.

The Directors of the Sevenoaks Water Company presented a favourable account of the working of the past half year, at the recent meeting of shareholders. There has been a substantial increase in the water revenue, and an equally marked reduction in the expenditure, as compared with the corresponding period of 1895. Owing chiefly to the long continued dry weather, the consumption of water has been very large; but the resources of the Company had been more than ample for all requirements, and had enabled them to meet the abnormal wants of consumers, at a reduced cost in pumping. The balance at the credit of profit and loss account is £1343, out of which sum a dividend at the rate of 8 per cent. per annum on the consolidated stock, and £5 12s. per cent. on the share capital, has been declared.

In moving the reception of the report and accounts at the half-yearly meeting of the Woking Water Company, the Chairman (Mr. Charles Horsley, J.P.) announced that the revenue for the past six months had been £3321 as compared with £3109 for the corresponding period of 1895; being an increase of £212, or 6·81 per cent. The expenses on revenue account had been £1510, as against £1390 last year. The profits for the six months had been £1811, as compared with £1719, or an increase of rather more than 5 per cent. The total expenses on capital account to June 30 amounted to £82,569. In the six months, 113 services had been laid, which were estimated to produce an annual revenue of £247. Building operations were at the present time being carried on very extensively in the district. The motion was unanimously adopted.

THE WELSBACH PATENTS IN GERMANY.

Decision of the Supreme Court.

In the "JOURNAL" for Feb. 11 last, we published a digest of the judgment of the Imperial Patent Bureau of Germany in the nullity suit brought against the holders of the Welsbach patent rights in that country. The judgment then given has now been considerably modified by the Supreme Court of the Empire, to which the matter was brought on appeal. The text of the decision of the Court, and a very voluminous exposition of the grounds on which it was based, have been published in full in the "Journal für Gasbeleuchtung." Dr. H. Lux gives in the "Zeitschrift für Beleuchtungswesen" a summary of the official decision and argument; and since his comments elucidate the obscure technical and legal phraseology of the original documents, we have availed ourselves of his articles in the preparation of the following summary, which is intended to be read in the light of the decisions of the Patent Bureau Judges, to which we refer above.

Claims 1 and 2 of patent No. 39,162 are struck out; and claim 3 is limited to certain specified intimate mixtures of earths, of which mantles may be formed by impregnation of tubular-shaped webs of vegetable fibre with their nitrates, sulphates, or like soluble compounds. For claims 1, 2, and 4 of patent No. 41,945 is substituted a claim for the addition of thorium oxide to the mixtures for the process described in claim 3 of patent No. 39,162. The annulment of claim 3 of patent No. 41,945 is rescinded; and claim 5 of the same patent is altered to admit of the admixture of cerium oxide to the materials described in claim 3 of patent No. 39,162. Claim 6 of patent No. 41,945 is altered so that it admits the replacement of zirconia and magnesia in the mixtures named in claim 3 of patent No. 39,162 by thorium oxide. The words "as previously described" are added to claim 1 of patent No. 74,745. Claim 2 of the same patent is altered to admit of a mixture of thorium oxide and uranium oxide being added to those named in claim 3 of patent No. 39,162; while claim 3 is altered to allow the same mixture to be used in the process described in patent No. 41,945. The further motions of appeal made by the plaintiff firms are rejected; and the remainder of those on behalf of the defendant companies are also thrown out. Of the official costs of the petition in the first Court one-fifth part is to be imposed on the defendant Companies; for the rest, the decision of the Patent Bureau is to stand. The costs of appeal on both sides are set off against one another.

Mantles are now made by impregnating a tube-like web of vegetable fibre with a mixture of 99 per cent. of thorium oxide and 1 per cent. of cerium oxide. The points at issue are: (1) Whether the mere manufacture is common property; (2) to what extent the use of thorium-cerium mantles was protected by Auer von Welsbach.

With regard to the first issue, the impregnation is only protected in respect of the materials expressly named in the specification, which does not show that general protection for the manufacturing process was claimed. Patent No. 39,162 names certain materials; and its third claim is for the manufacture of mantles from those materials. The subsidiary patents Nos. 41,945 and 74,745 are similarly restricted. The decision already given that claim 3, so far as it generally protects the method, is to be annulled, can only mean that the patent ought not to be granted for a process not limited to certain materials. Further the process cannot be protected in respect of the use of any single materials. The claims of the petitioners are admitted so far as the limitation of claim 3 to nitrates, sulphates, or similar compounds is concerned; while the appeal of the defendant companies against the partial annulment of that claim is rejected.

With regard to the second issue, it is argued that the claim cannot cover more than the invention, and that the inventor has not maintained that mixtures in any proportions of the substances specifically named give the result described. Though the composition of the mantles is not limited by patent No. 39,162 to any fixed proportions, yet it is not denied that there are limits, though wide ones, to the constitution of the mixtures which are effective. But as certain proportions which have proved best in the hands of the inventor are given, the granting of the patent is not precluded because they vary. Indeed, the statement that the rare earths may fall as low as 20 per cent. indicates an approximate limit to the proportions. In the course of his researches, Welsbach made the new discovery to which the recent very extraordinary results are apparently due. On Aug. 12, 1891, he notified the Patent Bureau that bodies having extraordinary power of emitting light, and of resisting heat, were formed from an intimate mixture of thorium oxide with quite small quantities of other oxides; and, the purer the thorium preparation, the more marked was the effect. But if certain compounds considered quite pure were subjected to further processes of separation, products were obtained by the fractionation which had different properties to those of the other products and of the original substance. The impurities pass into the mother liquor; but the crystals which should give a purer product yield an oxide of thorium, which differs in its properties from the ordinary pure oxide. It incandesces but feebly in the bunsen flame. The light it yields is yellow; while ordinary thorium oxide gives a pure white light. It resembles the ordinary oxide in being pure white, absolutely infusible, and non-volatile. Traces of the oxides of the metals of the rare earths, and especially of cerium oxide, even though so small as to defy our methods of testing, will impart to the thorium oxide thus purified by repeated

fractionation the power of emitting an intense white light which the ordinary oxide possesses. Quite a brilliant light is obtained by the addition of 0·1 per cent. of cerium oxide; and the maximum power of emission is reached with about 1 per cent. The mantles of this composition have the highest emissive power known for the temperatures of gas-flames. Other rare earths—notably terbium oxide—have a similar effect to the cerium oxide. Thorium oxide retains, with remarkable tenacity, small quantities of admixed earths. Thus cerium oxide, when mixed with it, is not volatilized by several thousand hours incandescence. In this respect the new mantles differ from the older ones; and the fact accounts for their greater durability. The inventor claims a patent for the application of such compounds for lighting purposes; but it is not granted except for the particular case of mantles of thorium oxide and uranium oxide to which the subsidiary patent No. 74,745 refers. He is, however, upheld in the claim of the specification of Aug. 12, 1891, for which priority was claimed by another. In England, patent No. 124 of 1893 was granted to Moeller; and, in his specification, it is stated that incandescent thorium oxide, when pure, gives comparatively little light, but that the addition to it of a small proportion—generally not exceeding 1 or 2 per cent.—of oxides of certain other rare metals gives it a very high illuminating power. The publication of this specification makes the invention common property in Germany inasmuch as it does not touch the compounds of varying proportions mentioned in patents Nos. 39,162 and 41,945, which do not possess the property stated in the specification of Aug. 12, 1891.

There is, therefore, no doubt that the use of 98 to 99 per cent. of thorium oxide and 2 to 1 per cent. of cerium oxide is unprotected in Germany, so far as this interpretation can be taken in conjunction with the following facts. In most cases, ordinary pure thorium oxide, as understood in 1886, applied by Auer von Welsbach's method, gives practically the result attained by the mixture specified in the English patent of 1893. The result is more sure and more pronounced with the latter; but no doubt the protection of patent No. 41,945 extends to this intentional mixture of the oxides of thorium and cerium. But the patent cannot be made by the defendant companies to uphold the thorium patent, or to widen its application where durability of mantles is concerned. It refers to the purification of thorium oxide and lanthanum oxide, and is not of value so far as the properties of a thorium oxide mantle are concerned. The only questions here left open are answered when claim 5 of patent No. 41,945 is dealt with. The mixture of 99 per cent. of pure thorium oxide and 1 per cent. of cerium oxide cannot be covered by the claim for two reasons. In this patent, thorium oxide must be understood to be such as the chemical knowledge of 1886 implied, and that mixture of 99 parts to 1 part would give a white light. The production of a white light by the use of 99 per cent. of thorium oxide and 1 per cent. of cerium oxide is, therefore, public property in Germany; and in the face of the clear exposition of the Supreme Court, the Civil Courts which have to try the actions for infringement of patent rights brought by the German Incandescent Light Company against numerous firms, cannot but nonsuit the Company if the firms produce a white light from 98 to 99 per cent. of thorium oxide and 2 to 1 per cent. of cerium oxide.

The monopoly of the German Welsbach Company is thus definitely broken down, to the benefit of a great industry which has instilled life into many other industries.

ELECTRIC LIGHTING NOTES.

The Liverpool Corporation have abolished their uniform charge of 7½d. per unit of electricity in favour of the following scale of prices, which will come into operation on Oct. 1: For each unit up to 1000 units per month, 7d. per unit; for each unit in excess of 1000 units per month, 4d. per unit; and for heating, cooking, or power (when supplied through a separate meter), the charge is to be reduced from 5d. to 4d. per unit. Consumers occupying two or more places of business are to be allowed to have them included in the same account; and meter-rents are to be lowered from 2s. to 1s. per month.

A Sub-Committee of the Dudley Town Council has recommended the Corporation to apply for a Provisional Order, empowering them to undertake electric lighting. The estimated cost of the necessary works is £25,000.

Last Tuesday the newly-erected electric light station at West Holborn, South Shields, was duly inaugurated by the Mayor of the town, who was accompanied by the members and officers of the Corporation and others specially interested in the prospects of the scheme. Three years ago, when this question of electric lighting was forced upon the Corporation, they boldly assumed the rights and privileges of proprietorship themselves, instead of adopting the policy of several other towns of letting in private companies. In another way, the Corporation discarded the tendency of the times, as at the very outset they dispensed with the services of a Consulting Electrical Engineer, and preferred rather to rely upon their own Electrical Engineer and themselves. They began their work well. The established principle in many towns and cities has been for long enough to accept the lowest tenders sent in; but the South Shields Electric Light Sub-Committee subordinated the question of price to reliability and efficiency—believing that in this way they would realize the truest economy. Results have abundantly justified their action; and the installation which the town now possesses is, in the opinion of experts, one of the best and most successful in the kingdom. The scheme was really first taken up in earnest when the Corporation, in November, 1893, out of a host of applicants, appointed Mr. Joseph A. Jeckell, A.I.E.E., as Borough Electrical Engineer. Messrs. S. Z. De Ferranti, Limited, were the contractors for the electrical plant, which is on the system known as the high-tension feeder system with low-tension distributing-mains for private consumers. The arc lamps are run by means of rectified current, supplied to them by a separate set of cables; and the present machinery at the station is sufficient to admit of considerable extension of street lighting. The alternators which generate the current are direct driven, with ironclad armatures. The engine, alternators, and exciter are all coupled together on a single shaft, which is a palpable improvement on the system in which belting was rendered indispensable. The engines are of the well-known triple-expansion inverted cylinder type. They have been carefully tested for steam consumption, and have proved to be very economical, especially at light loads. They use steam at 160 lbs. pressure, and travel at 125 revolutions per minute with a 2-feet stroke. This is the only station excepting Cardiff where triple expansion engines have been employed when coupled direct to alternators. The tendency nowadays is to go in for this three-crank class of engine as the turning movement is so very much less than when only two cranks are used. The total cost of the scheme will, it is believed, not exceed the original estimate of £28,000. The process of switching on the light to the consumers was performed by the Mayor amid the hearty applause of those present. Afterwards the company visited the Free Library, where the light has been laid in; and they then adjourned to the Town Hall. Alderman Rennoldson, at the close of the dinner, proposed "Success to the Electric Lighting Undertaking of the Borough." He said that the question of electrically lighting the streets of the town was forced upon South Shields some three years ago; and he was glad that the Council then and there took it up determinedly, and decided that it should be a Corporation undertaking, and not allowed to fall into the hands of a private Company. They knew the position they were in in regard to the Gas and Water Companies in the borough. Certainly, it was not an over-favourable one; and they would readily agree with him that the Corporation on this occasion had acted wisely in making the electric lighting their own absolute property for all time to come. He was sorry that their friends connected with the gas undertaking in the town were disposed to look upon this effort of the Corporation with a little suspicion, and, he might also say, with a little disfavour. He was confident that the undertaking would not harm them to any appreciable extent. There was room for both of them. The demand for gas for other purposes than lighting was becoming increasingly and exceedingly large; and the demands upon the local Gas Company were quite as much as they could supply with any degree of comfort. They had only to look at the fact that gas stock in the town, and in other towns where electric lighting had been brought into vogue, stood higher at the present time than it ever did before; and he was not aware that in any town where electricity had been adopted as the public illuminant, gas stock had fallen in value one iota. He only hoped that the electric light in South Shields would prove very largely beneficial to the people of the town; and he expressed his belief that before the end of the year they would have reached practically the limit of their producing power in the matter of private lighting. The toast was enthusiastically responded to; and the Mayor briefly replied. He concluded by proposing the health of the Chairman and members of the Electric Lighting Committee for the valuable services they had rendered to the town in successfully launching this great work. He paid a high tribute to the members individually, and to the Chairman in particular, for their indefatigable exertions; and he congratulated them on the successful termination of their duties. Mr. De Ferranti, replying to the toast of his health, complimented the town on being able to place so many experienced practical men on the Sub-Committee, and on having obtained the services of Mr. Jeckell as their Engineer. Mr. J. R. Lawson, sen., proposed the health of the Town Clerk and the Electrical Engineer, both of whom suitably replied.

Suicide by Coal Gas.—A man named Kitz, of Cheltenham, committed suicide last Wednesday, under extraordinary circumstances. He attached an india-rubber pipe to a gas-jet, and placed a small stove in his bed. He then covered himself over with the bed-clothes, and was found dead some hours after. Kitz was a married man; but his wife and children were away on a holiday.

Water Gas for Rotherham.—A Sub-Committee of the Gas Committee of the Rotherham Town Council have been considering various schemes for increasing the productive capacity of the gas-works; and they have come to the conclusion that the make can be rapidly augmented by adopting a carburetted water-gas system. Seeing that it would be impossible to erect the necessary works in time for use in the coming winter, the work is not yet to be put in hand; and, in the meantime, further information on the subject is to be obtained.

Stockton Gas Committee and an Agreement with the Men.—The Stockton Town Council had an animated discussion at their meeting last Tuesday over a proposed agreement between the Gas Committee and their men as to the duration of engagements, wages, and general conditions of labour at the works. A report of the discussion which has reached us does not clearly state the terms of the agreement; but some remarks by the Chairman of the Gas Committee (Alderman Richardson) indicate that the agreement would be for six, nine, and twelve months. He also described the conditions as being perfectly fair to the men. On the other hand, the representatives of labour in the Council regarded it as being an unfair attempt to take advantage of men who, as one of them put it, "were only weakly organized in a Trade Union sense." The connection of the Gas Engineer (Mr. W. Ford) with the matter made him the subject of some unkind remarks from the same quarter. It was decided to refer the subject back to the Committee for further consideration.

A New Gas Plant Works.—A new firm has recently started at Retford to supply the ever-growing requirements of the gas industry for machinery and apparatus of high class. Mr. Jenkins, who is at the head of the new concern, is well known in gas circles, as he was for many years with West's Gas Improvement Company, Limited, of Manchester. We are informed that the works at Retford stand on 3½ acres of land, and have every facility for turning out a large quantity of work—being provided with all the usual machine, erecting, and platers' shops, with a very large foundry; and having railway sidings into the works, giving direct access to three of the principal Railway Companies' trunk lines. Retford is one of the main junctions of the Great Northern, the Manchester, Sheffield and Lincolnshire, and the Midland Railways; and it is surrounded on all sides by collieries and blast-furnaces, so that the raw material is close at hand. These circumstances, combined with the experience and known penchant of the head of the firm for excellent productions, should lead to the success of the new venture.

THE SOUTH SHIELDS TOWN COUNCIL AND THE WATER COMPANY.

Alleged Polluted Source of Supply—Legal Proceedings Threatened.

At the Meeting of the South Shields Town Council last Wednesday, Mr. W. A. Hedwith moved—"That, in the opinion of this Council, the water supplied to the town by the Sunderland and South Shields Water Company is bad in quality and insufficient in quantity, and that the Special Water Committee be and are hereby authorized and requested to take the necessary legal proceedings to obtain an injunction compelling the Water Company to cut off the Cleadon reservoir as a polluted source of supply; and to take such further and other legal steps as they may be advised to compel the Water Company to fulfil their legal obligations to the town in a reasonable and proper manner." Mr. Hedwith traced the complaints as to the water supply back to 1891. An analysis was then made which showed that the total solids contained in the water were 73 grains per gallon, including 33 grains of common salt. In 1892, a complaint was made by the ex-Town Clerk, of an analysis of water taken from a fountain in the Market Place, which showed that the total amount of solid constituents at that time was 84 grains per gallon, including 37 grains of common salt. Coming down to 1895, the question was again raised; and three samples were analyzed—the results being sent to the Company. The sample taken from the Cleadon well showed 184 grains of solid matter, including 126 grains of common salt, while the Fulwell water only contained 32 grains of solids. This, Mr. Hedwith contended, conclusively proved some grave defect in the condition of the Cleadon well. They had had a long correspondence with the Company, but the results were not, in his estimation, of a character which should satisfy them. In suggesting the remedy he did, he was only asking the Council to follow the precedent of the Tynemouth Corporation, who, under somewhat similar circumstances, went to the Queen's Bench for an injunction. They obtained it, and, as the result, had now a good and wholesome water supply. The Chairman of the Water Company frankly told their deputation that he would not drink the water himself. It was no use for domestic purposes; and no one would think of using it. The motion was seconded by Mr. Davidson, who accused the Corporation Water Committee of not having done all they could in the matter. Alderman Wardle denied this, and quoted from a report as to a decision they had come to to meet that day a consulting engineer on the question as to any other sources of supply for the borough. The proposal, he held, was altogether inopportune, and would not do an iota of good. On the contrary, if it was followed to its legitimate issue, it would be the means of paralyzing the whole of the commercial energy of the town, because the Company were not compelled to supply any water whatever for manufacturing purposes; and they would have none to supply if the Cleadon well was cut off altogether. He believed the Company had done their utmost to meet this terrible trouble, and had spent thousands of pounds in order to do so. The consumers were receiving better water now than they did a month ago. Several other members took part in the discussion, in the course of which the Town Clerk expressed the opinion that it would be inadvisable for the Council to pass the proposed resolution at the present time. It was quite possible that, in the course of a month or two, results might justify it; but, in the meantime, they had engaged an expert who was to carry out a survey and report to them on the subject. He thought they should at least hear his views before taking action. Mr. Hedwith claimed for his resolution that it gave all the discretionary powers that were needed under the circumstances; and the motion was carried by twelve votes to five.

THE PROPOSED PURCHASE OF THE CHICHESTER WATER-WORKS.

At a Special Meeting of the Chichester City Council last Friday, a letter was read from Mr. E. Arnold, the Secretary to the Chichester Water Company, to the effect that the decision of the Directors as to the terms on which they would dispose of their undertaking was meant to be final; but, at the very urgent request of the Mayor (Mr. E. Prior), they had agreed to an alteration in clause 17, beyond which no further concession would be made. The Mayor said when he left the Council Chamber the previous week, he had given up all hope of the proposal to purchase the water-works being carried out; but he had another interview with the Directors, and pointed out how very objectionable was the clause under which the price was fixed at 10d. per 1000 gallons for a number of years. The result was that it was agreed to refer this matter to arbitration—the Arbitrator to be appointed by the Board of Trade. Mr. Gale considered that the Mayor had gone outside the duties of his office in interviewing the Directors of the Company after the decision of the Council of a week before, when they resolved not to submit to the terms suggested. Mr. Ballard pointed out that the matter was discussed in Committee, and was supposed to be kept private; and yet the Mayor had divulged what had taken place to the Directors—the very men who ought not to know, or otherwise why should the meeting have been kept private. He protested against the matter being reopened, because members who a week ago had voted with the majority against the purchase had gone on their holidays, never thinking the question would crop up again so soon. Mr. Edney endorsed these remarks, and said that at Basingstoke it had been found possible to supply water at a profit at 3d. per 1000 gallons. In Chichester, they had been paying 1s. 2d., though the Railway Company only paid 6d. It was very certain that, if they bought the water-works, there would be a heavy burden on the rates for many years. He was against the purchase; and as to the non-supply of water to parts of the city, if the Company would not extend the mains so as to give a supply, he advocated going to the Local Government Board for powers to establish water-works of their own. Mr. Buchan contended that the proposed agreement was a very one-sided document. Mr. Buckell said the question to decide was not the purchase of the works, but whether the public should have an opportunity of voting on the proposal. He considered the Company had been most reasonable in their terms. The Mayor said it was important that the matter should be settled as soon as possible, because the Company would not wait. He was assured that, if the delay went on another week, the Company would not sell their concern under another £10,000, because they could dispose of it elsewhere on these terms, and get the agreement signed in a week. It was thereupon decided, by nine votes to seven, that the seal of the Council be affixed to the agreement at the next meeting; and that the name of Mr. Mansergh should be placed before the Company as the Engineer to act on behalf of the Corporation.

TORONTO WATER SUPPLY.

[From the "Engineer."]

A very elaborate report on the water supply of the city of Toronto has been presented by Mr. J. Mansergh, M.Inst.C.E., as a result of his visit, at the invitation of the Toronto authorities. The present supply from Lake Ontario has caused some trouble through the floating of the intake main. Mr. Mansergh spent a fortnight at Toronto, and has issued a report on the three plans considered—viz, an improvement of the present supply pumped from Lake Ontario; a gravity supply from Lake Simcoe, a body of water covering some 300 square miles, situated some 45 miles north of, and 473 feet above Toronto, and having a watershed of about 1100 square miles; and a gravity supply from the Ridge Lakes and Don and Rouge Rivers. The Ridge Lakes consist of a series of six small lakes, some of which have no known outlet, situated on the watershed between Lake Ontario and Lake Simcoe about 23 miles north of Toronto. Their united area is about 9½ square miles. The Don and Rouge Rivers rise about 20 miles north of Toronto, and flow south, emptying into Lake Ontario at the city. The united watersheds of these small lakes and rivers cover about 151 square miles. Mr. Mansergh estimates that with an average rainfall of 36·68 inches per annum, the minimum rainfall for any one year would be two-thirds this, or 24·42 inches; and that the average of the three driest years would be 29·30 inches. Calling this 30 inches, and allowing 15 inches for evaporation, he estimates a daily yield of 90,600,000 gallons from the 151 square miles in this watershed. But the storage provision of 4,443,000,000 gallons Mr. Mansergh thinks too small, as it is not fifty times the daily quantity obtainable; and he would never think of providing less than 200 days' storage with such a rainfall as prevails there, in order to utilize the whole of the water, and be certain of maintaining the full supply during a drought. Assuming, against his belief, that 4,443,000,000 gallons are available for storage, Mr. Mansergh puts the reliable daily supply from this source at 56,190,000 gallons.

Mr. Mansergh thinks a reservoir holding 500 million gallons and a 27-inch pipe would be needed; and he estimates the reservoir at £100,000, and the pipe-line at 29s. per foot—making the total cost of the project, allowing 15 per cent. for extras and contingencies, £195,500. While this supply is more than Toronto will probably need for fifty years, and the estimated cost not excessive, Mr. Mansergh unhesitatingly condemns this source of supply, especially because the water is not pure enough to do without filtration works and plant; and, moreover, the watershed is liable to pollution. The bulk of the report is devoted to a statistical and financial comparison between the Lake Simcoe and Lake Ontario schemes, as Mr. Mansergh thinks there is little to choose between the qualities of the Ontario and Simcoe waters, provided the former is filtered. The average daily consumption of water per head in Toronto is 107 gallons. Mr. Mansergh is unable to account for so high a figure; but admitting it, he assumes a consumption of 100 gallons as sufficient for future needs, provided some attempt is made to check waste. On the advice of the best authorities, he assumes that Toronto's present population of 175,000 will increase at a rate of 2 per cent. per annum for the next fifty years, which will give a population of 500,000 in 1948, calling for a daily supply of 50 million gallons.

The main features of Mr. Mansergh's plan for getting the water to Toronto are as follows: A 6-feet steel intake-pipe laid in open cut 3960 feet into the lake; a masonry tunnel, 33 miles long, of horseshoe section, 8¼ feet by 7 feet in the clear, on a slope of 1 in 4000, and with a daily capacity of 51 million gallons up to the springing line; a syphon of cast-iron pipe 5000 feet long, two pipes 32 inches in diameter until the year 1913; 9000 feet of "cut-and-cover" horseshoe conduit, the same section as before; a second syphon 53,000 feet long, ending in a new reservoir at Eglinton, with its surface 300 feet above Lake Ontario, and a capacity of 100 million gallons. Neglecting the cost of right of way and damage claims for diversion of water from the Severn River—the outlet of Lake Simcoe—and allowing 15 per cent. for contingencies, the estimated cost of this work is $12,000,000, or £2,400,000. In regard to designing the masonry work to meet the estimated demand of fifty years hence, Mr. Mansergh's own words in recommending the Ontario scheme are: "The Simcoe scheme should not be designed and carried out on less broad lines than I have set out. It would never do to construct a tunnel over thirty miles long with a smaller carrying capacity than 50 million gallons daily, for it would be such a terrible business to have to make another alongside in a few years' time if the city were to increase faster than is estimated.

Assuming that money can be borrowed at 3½ per cent. with a sinking fund obligation of 3 per cent., which may be combined to make an interest charge of 5 per cent., the annual charges would commence with $89,500, or £17,900, in 1896, increasing gradually to $550,000, or £110,000, in 1900, to $606,000, or £120,000, in 1935, when they would drop in six years to $53,000, or £10,600—the principal having been paid off. This smaller charge would cease in 1973, except $6000, or £1200, required for maintenance, unless enlargements were needed before then.

The improvements to the present system proposed by Mr. Keating, the City Engineer, are chiefly a tunnel 5820 feet long and 138 feet below the lake level, running from a shaft at the pumping-station on the mainland to a shaft on the island which lies between Toronto Bay and Lake Ontario proper; and from this shaft on the island a 6-feet steel

pipe running 2250 feet out to the intake crib, replacing the present wooden intake-pipe. Mr. Keating estimated that with a masonry tunnel of 75 million gallons daily capacity, and a steel pipe of a capacity of 40 million gallons daily, the work could be done for $540,000. Mr. Mansergh endorses this plan as far as it goes; but he also recommends that a small pumping-station should be erected near the shore crib on the island to lift the water about 7 feet into two subsiding-tanks to hold 11 million gallons each. The water would be delivered into one end of these tanks, and be drawn by an overflow from the other on to the filter; depositing the matter held in suspension during its slow passage through them. He proposes to keep these filters up, and to pump the water; because he believes if they were kept down, so that the water could gravitate into them, the cost of construction would be greatly increased, and some power would in any case be needed to drain the filters and for sand-washing, and as the buildings containing the filters would require some heat as a protection against the weather. Filter-beds may be constructed only as fast as needed. A new service reservoir must be built at Eglinton with a capacity of 50 million gallons and a flow-line 300 feet above Lake Ontario. Mr. Keating's recommendations as to the distributing system are endorsed; but in regard to the tunnel through the rock under the harbour, which Mr. Keating proposed to line with brick and concrete, Mr. Mansergh says: "Mr. Keating should consider if it might not be better to lay it parallel to the surface of the rock at a shallower depth than as shown on his section, and line it with cast-iron plates, forming a circle in cross section with internal flange joints, excavating as nearly as possible to the size of the outside of the plates, grouting the space with cement under pressure, and filling the panels between the flanges." The estimated cost of these improvements, for which two years' time is given for construction, is, for the intake tunnel and pipe, $486,000; subsiding reservoir, $110,000; filter-beds, $960,000; pumping plant to filters, $50,000; tramway across island, $15,000; and distributing mains, $467,250. Allowing 15 per cent. for contingencies, the figures in our copy of the report add up to a total of $2,402,062; while as given by Mr. Mansergh this total is $2,689,562. We find no estimate for the cost of the new reservoir at Eglinton. The improvements needed before 1944 will cause an expenditure by that time of $5,685,312 as the total is printed, or $5,397,812 as the items add up. In his recommendations, Mr. Mansergh, after stating that he thinks "there is no necessity to labour the matter further," advises that the Lake Ontario pumping scheme should be adopted, as being more adjustable to the future needs of the city, although his natural inclination and predilection are in favour of the Lake Simcoe scheme. While the currents in Lake Ontario are such as to protect the water supply, Mr. Mansergh protests against Toronto's discharging its crude sewage into its tideless and practically stagnant harbour as certain to cause trouble in time.

New Joint-Stock Company.—A new Company has been formed under the title of the Kromfontein Coal Company, Limited, with a capital of £80,000, in £1 shares, for the purpose of acquiring certain mines and rights in South Africa, and of carrying on the business of colliery proprietors, suppliers of water, &c.

The Kirby Lonsdale District Council and the Gas-Works.—In the course of the proceedings at the recent meeting of the Kirby Lonsdale Gas Company, the Chairman (Mr. J. R. Picard) mentioned that negotiations had been pending between the Directors and the District Council for the sale of the works. It now seemed, however, according to a letter received from the Council, that unexpected difficulties had arisen by reason of the Company supplying outside the district. It appeared to him that the Council were only acting reasonably in hesitating to buy in face of the large expenditure which must be incurred practically for no return. The communication from the Council stated that, whereas they could obtain the necessary powers to supply gas within the district by a Provisional Order, to supply Casterton an Act of Parliament would be needed; and the cost of an Act would, in the opinion of the Council, be prohibitive of the purchase of the entire works. The Council therefore inquired if the Company would be willing to sell such portions only of the works, plant, and pipes as applied to the district of the Council. The matter is to be further considered by the Directors.

Manchester Corporation Water Supply.—In moving the adoption of the proceedings of the Water Committee at the meeting of the Manchester City Council on Wednesday last, Sir John Harwood announced that the Committee had made arrangements by which the North Cheshire Water Company would obtain their water from Manchester. The Committee had agreed to lay down a new main at a cost of £19,900; the North Cheshire Company paying 4½ per cent. on the outlay. Under the old arrangement with the Company, they obtained their water at a very cheap rate; but the water they took in future they would be charged for at the maximum rate. Sir John further stated that, in consequence of the large increase in the consumption of water, the 30-inch main from Godley reservoir was so largely drawn upon that water could not be delivered with proper force; and it was therefore proposed to lay down a new main. Considerable alterations would be necessary, involving a cost of about £37,000. The Committee proposed to go to Parliament for powers. The minutes were passed. The prudence of the Manchester Corporation in obtaining a supply of water from Thirlmere in addition to that which they possessed in the Longdendale Valley has been abundantly proved—if further proof were needed—by the events of the past few months. There were long periods of dry weather during the spring and summer; so that without the Thirlmere supply the Water Committee would have been hard pressed. As it is, the Committee have been able without the least trouble, to meet the increasing demands upon them. Two years ago, the average daily consumption of water was 25 million gallons; now it is 28 million gallons—some seven or eight millions being drawn from Thirlmere Lake. It will be interesting to many to learn what a great difference there is between the rainfalls at Woodhead and Thirlmere. At Woodhead during the seven months ended July 31, there was a fall of 22·36 inches against 24·26 inches in the corresponding period of last year; whereas at Thirlmere for the same period this year, there were 40·8 inches, and only about 28 inches in the first seven months of 1895.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A question has been raised in Aberdeen which I have sometimes wondered has not arisen sooner, regarding the rate of wages paid to workmen in the employment of corporations. It is well known what sinister influences members of public bodies are subjected to now-a-days, when, as is patent to everybody, the person who promises most to the lower orders is the most likely to be returned to municipal office. Having made his promises during election time, he is not, after election, allowed to forget them. A section of the "representative" members in the body clamour for the establishment of a minimum wage for corporation employees; and an experiment is made in one department, which leads to envious eyes being cast from other departments on the favoured one; and, sooner or later, a process of levelling up in the matter of wages has to be entered upon. In Glasgow an agitation has been led by one of those gentlemen whose boast it is that they represent only one section of the community, for the establishment of a regulation practice that no Corporation workman shall be paid less than 21s. per week. The Corporation have been slow to adopt any such principle. But a policy of liberality has been followed; and the object of the agitators is thus gained indirectly. In Edinburgh and Leith, the wages bill in the gas-works has risen by about £8000 a year during the past eight years. Dealing with Aberdeen, it is found that the wages of stokers and labourers in the Gas Department rose in 1895-6 from £7461 to £7811, and that on June 1 last—the day after the accounts closed for the year—there was another rise of about 5 per cent.; the two increases being equal to nearly ¼d. per 1000 cubic feet of gas sold. It is not the infinitesimal increase in the cost of gas which anyone would make the occasion of objection; it is the fact that Corporation employees are being paid more than the market value of their labour. Thus, for instance, labourers in the gas-works receive up to 25s. 6d. per week; and assistant stokers and potmen to 24s. 6d. per week; whereas the labourer to an ordinary contractor has to be content with from 17s. to 19s. per week. But the contrast is greater than these figures show, because, whereas the gas-works labourer has no broken time, has both medical attendance and medicines free, and the prospect of an allowance during disablement or in old age, the ordinary labourer has none of these benefits. It is scarcely possible to compare the wages of machinemen or hand stokers with local contemporaries, because similar occupations do not exist; but their pay—from 28s. to 29s. per week—is locally regarded as high. In an article in the "Aberdeen Free Press" dealing with the subject, it is pointed out that in all the other departments similar increases have been made; and the conclusion is come to that the Town Council have been extravagant in their management of the city's affairs. The writer proceeds: "When one looks into these things one wonders that the working classes, who, like the rest of the community, have the rates screwed out of them to pamper these favoured Corporation employees, even to the selling of their 'sticks' on the Castlegate, do not rise and perform on the members of the Council responsible for these things the 'clean sweep' of the olden days. Pipelayers and fitters at the gas-works, superior labourers, who would ordinarily receive 23s. a week, had their pay raised to 27s. for 51 hours; and carters, for 51 hours, are now in receipt of 23s., which is 3s. a week more than is paid to carters in private employment for nine hours' more work, who have also to pay for their doctor and their drugs themselves, and make the best they can of their scanty wage in providing for a rainy day." That a newspaper of the profession of the "Free Press" should write in this strain is some indication of a change of opinion in social economics. The last general election showed that the country was sick of socialistic nostrums; and, in the natural course of events, it could not have been long before a movement should set in for the putting aside of some of the rashly adopted proposals of that school. The socialists have of late years endeavoured to appropriate the influence of Trade Unions in their propaganda. The policy was a mistaken one, for the Trade Unionist is essentially a selfish man, not necessarily in the sordid sense, but his endeavour is to help himself no matter what may become of the members of other unions, and there is nothing further from his mind than the creation of a state of society in which equal conditions should prevail. The antagonism of the socialistic and the Trade Union propaganda is certain to be emphasized whenever either the one or the other comes more or less into operation with such force that there will be a rupture. This is, however, what may be called the abstract public side of the question. What is brought forward in Aberdeen is the practical side of it, which, after all, is the one that most concerns the community. Whenever the communities learn that the candidate who promises to give better wages to Corporation employees is their enemy in respect that he desires to benefit a comparative few at the expense—and to the envy—of the many, his chance of election will be gone; and with its disappearance so will he. It is too much to hope that this will take place universally; but that a movement in the direction is likely, is more than probable. And nothing will help it better forward than the exposure in the Press of the direction in which socialistic sympathies are leading public men.

The Electric Light Committee of the Edinburgh Town Council have adopted the following estimates for the current year: Expenditure, £20,325. The actual expenditure for 1895-6 was £13,985 18s. This is made up under the following heads: Generation of electricity, £5425; distribution of electricity, £835; public lamps, £1740; rents, rates, and taxes, £1220; expenses of management, £1635; interest and contribution to sinking fund, £9470. The estimated revenue for 1896-7 is £24,475. The estimated revenue for 1895-6 was £12,640; the actual £16,721 4s. 6d. It is made up as follows: Sale of current by meter, £16,500; charges for arc lamps, £7875; other sources, £100.

The Clyde Lighthouses Trust since the construction of their gas manufacturing works at the Mirren Shore, Port-Glasgow, have done much during the past decade to make the navigation of the river by night more easily accomplished than it formerly was. Quite recently a group flash-light—the first of its kind in Britain—was substituted in the Perch Lighthouse, immediately opposite Port-Glasgow, for a stationary light, which, on account of its nearness to the shore, had proved

deceptive both to outgoing and incoming steamers. At the same time, an occulting light, supplied with gas from a tank in the buoy on which it is placed, was fixed on the opposite side of the channel, showing the fairway plainly at this bend in the navigable portion of the river. The Trust are now making arrangements to lay down a complete series of gas-lighted buoys between Greenock and Port-Glasgow, every alternate buoy to be lighted.

At a meeting of the Leith Town Council on Tuesday, it was remitted to a Committee to consider as to applying to the Board of Trade for a Provisional Order authorizing them to supply electricity for light and other purposes. It is estimated that the cost of an installation would be £25,000; the annual expenditure, £2780; the revenue, £6850; and that if the plant were fully employed, there would be a surplus of £4070, but, if it were not, of £133. The desire of the movers in the matter is to be upsides with the Edinburgh Corporation.

The Glasgow Corporation Gas Committee have received an application from Mr. George Young, their Meter Inspector, for a retiring allowance. In all, he has been for the long period of 34 years in the gas service of the city—first, with the City and Suburban Gas Company, and since the year 1869, in that of the Corporation Gas Commissioners; and he is now unfit for further active duty. Fortunately, the two Gas Companies which preceded the Gas Trust invested a considerable fund, which was to be employed in providing retiring allowances for all servants, the administration thereof to be in the hands of the Gas Committee. The application has been remitted for consideration and report to Mr. Fife, the Convener of the Finance Sub-Committee, and ex-Bailie Mitchell, the Convener of the General Committee on Gas and Electric Lighting.

The proposal has been made in the Gas Committee of the Dundee Town Council that gas for motive power, cooking, and heating, should be sold at a cheaper rate than it is at present. Mr. Robertson brought the subject forward; and it was remitted to the Convener and the Gas Manager to consider and report as to the practice in other towns. There should be no dubiety as to the nature of the report.

The Water Committee of the Aberdeen Town Council have estimated that for the current year the total expenditure will be about £26,100, and the total revenue £25,755, leaving an estimated surplus of £345. The expenditure includes a sum of £800 as the instalment for the year towards the cost of the works at Invercannie Reservoir. But for this circumstance, the Water Committee would have been able to reduce the rates by about a penny this year.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 5.

Sulphate of Ammonia.—No feature of importance has been imported into the market this week. The general position is still more or less dominated by speculators; and, in pursuance of the usual tactics, purchases for the month are being withheld in the hope of more favourable opportunity later on. Scotland, which has all along led the way in marketing sulphate as produced, has been the first to feel the effect of the present lull; and prices there have dropped from £7 11s. 3d. to £7 10s. f.o.b. Leith. In some cases, even £7 8s. 9d. is stated to have been accepted. Values at English ports have not been affected, as, in the absence of any superabundant supply, there has been no pressure to sell; and the direct orders have been sufficient to absorb the production, which, at the present time, is very light. Quotations are £7 11s. 3d. to £7 12s. 6d. f.o.b. Hull, and £7 15s. Liverpool. For forward delivery, makers' ideas of value still rule at £8 to £8 5s., according to position. At the same time, the greater disposition of consumers to avail of opportunities has somewhat checked the reckless offers of "bear" speculators. Consumers can hardly fail to recognize how much below its intrinsic value sulphate really is, when demand will inevitably tend to raise prices to their normal level.

Nitrate of Soda.—The market is very dull. The value of near cargoes is 7s. 9d.; and July-August shipment, 8s. The spot price is 7s. 10½d. to 8s. per cwt.

LONDON, *Sept.* 5.

Tar Products.—Benzols have slightly advanced beyond last week's prices, although the volume of business done has not been so great. For September delivery, 4s. 6d. has been given for 90's; but forward business is at lower figures, ranging from 3s. 10½d. to 3s. 11½d. for 90's, and 2s. 9d. to 2s. 10½d. for 50's. Business in toluol has been done at 2s. 2d. to 2s. 2½d. These figures will no doubt encourage carbonizers to work to their utmost; and, with the increasing make as the season progresses, it is probable that the present limits will be somewhat checked. Pitch is quiet, and but little business reported; buyers apparently not being ready to cover their forward requirements. Considerable business in carbolic has taken place; sales at 1s. 9d. to 1s. 10d. having been made for September-December delivery. But little fresh business is reported in anthracene. Stocks, however, are low; and the contracting period is near at hand when buyers usually cover their forward requirements.

Prices are: Tar, 19s. to 27s. 6d. Pitch, 31s. Benzols, 90's, prompt, 4s. 6d.; forward, 3s. 11d.; 50's, prompt, 3s.; forward, 2s. 10d. Toluol, 2s. 2½d. Solvent naphtha, 1s. 6d. Crude naphtha, 30 per cent., prompt, 1s. 3d.; forward, 1s. 2d. Creosote, 2d.; liquid, 2⅜d. Heavy oils, 4½s. Naphthalene, pressed, 65s.; salts, 35s. Cresylic acid, 1s. Carbolic acid, 60's, 1s. 10d. Anthracene, "A," 10½d.; "B," 8½d.

Sulphate of Ammonia.—There seems but little change; prices ranging from £7 7s. 6d. to £7 12s. 6d., less 3½ per cent., which is considerably lower than nitrate of soda.

Gas Exhibition.—The Alliance and Dublin Consumers' Gas Company, by arrangement with Messrs. J. Wright and Co., Limited, of Birmingham, are now holding a gas exhibition, with a course of cookery lectures by Mrs. Thwaites.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 452).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	25½–26½	..	3 19 3
100,000	10	"	7½	Do. 7 p. c.	18–19	..	3 18 11
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	108–110	..	4 10 11
200,000	10	12 June	5	Belgrano (B. Ayres), Limited	10–10½	..	4 15 3
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100–103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7⅞–8½	..	3 18 9
40,000	5	"	6½	Do. New, £4 paid	5½–6	..	4 6 8
380,000	Stck.	13 Aug.	12	Brentford Consolidated	285–290	..	4 2 9
210,000	"	"	9	Do. New	215–220	..	4 1 9
50,000	"	"	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
159,375	"	12 June	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	27 Mar.	11½†	Brighton & Hove Original	247–252	..	4 11 3
208,820	"	"	8½†	Do. A Ord. Stk.	190–195	..	4 7 2
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	127–132*	..	3 15 9
420,000	20	27 Mar.	11½	British	57½–58½	..	3 16 11
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	22–23*	..	5 0 0
71,000	10	"	8½	Do. 7 p. c.	19–20*	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	10¾–11¼	+¼	4 8 11
200,000	100	1 July	6	Do. 6 p. c. Deb.	103–106	..	5 13 2
150,000	20	15 July	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	29 May	8	Cape Town & District, Ltd.	16–17	..	4 14 1
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58–60	..	5 0 0
550,000	Stck.	15 Apl.	13½	Commercial Old Stock	345–350	..	3 17 2
165,000	"	"	10½	Do. New do.	260–265	..	3 19 3
165,000	"	12 June	4½	Do. 4½ p. c. Deb. do.	152–157	..	2 17 3
800,000	Stck	12 June	13	Continental Union, Limited.	285–290	..	4 9 8
200,000	"	"	10	Do. 7 p. c. Pref.	220–225	..	4 8 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c.	315–320*	..	4 7 6
163,400	"	"	11	Do. B 7 p. c.	250–255*	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	140–143*	..	3 13 5
60,900	"	"	5	Do. 5 p. c. Pref.	140–145*	..	3 9 0
486,090	10	15 July	11	European, Limited	26½–27½	..	4 0 0
354,060	10	"	11	Do. £7 10s. paid	18–19	..	4 6 11
5,746,590	Stck.	13 Aug.	12¾	Gaslight & Coke, A, Ordinary	315–320	+1	3 19 8
100,000	"	"	4	Do. B, 4 p. c. max.	110–115	..	3 9 7
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	305–315	..	3 3 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	147–152	..	3 5 9
60,000	"	"	7½	Do. G, 7½ p. c. do.	212–217	..	3 9 1
1,300,000	"	"	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	"	"	10	Do. J, 10 p. c. Prf.	305–315	..	3 3 6
476,000	"	"	6	Do. K, 6 p. c. Prf.	173–178	..	3 7 5
1,061,150	"	12 June	4	Do. 4 p. c. Deb. Stk.	138–143	..	2 15 11
294,850	"	"	4½	Do. 4½ p. c. do.	153–158	..	2 16 11
908,000	"	"	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	14 May	6	Hongkong & China, Limited	12–13	..	4 12 4
3,820,000	Stck.	14 May	12	Imperial Continental	252–257	..	4 13 4
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk	108–110	..	3 3 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	115–118	..	4 4 10
250,000	100	"	4½	Do. 4½ p. c. Debs.	110–112	..	4 0 4
541,920	20	12 June	5	Monte Video, Limited	16½–17½	..	5 14 3
150,000	5	29 May	8	Oriental, Limited	8½–8¾	..	4 11 5
135,000	5	"	8	Do. New, £4 10s. paid	7½–7¾	..	4 12 10
15,000	5	"	8	Do. do. 1879, £1 paid	1¾–2	..	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	1 May	6	People's Gas 1st Mtg. Bds.	105–110	..	5 9 1
500,000	100	1 June	6	of Chicago 2nd Do.	102–107	..	5 12 1
250,000	10	27 Mar.	8	San Paulo, Limited	13⅞–14½	..	5 10 4
5,475,000	Stck.	13 Aug.	5⅝	South Metrop., 4 p.c. Ord.	152–155	+2	3 7 1
820,000	"	15 July	5	Do. 5 p. c. Deb. Stk.	173–176	..	2 16 10
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	255–265	+20	4 6 9
60,000	"	"	8½	Do. B	185–195	..	4 7 2
170,380	10	29 May	10	Tuscan, Limited.	13¾–14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100–102	..	4 18 0

WATER COMPANIES.

746,123	Stck.	26 June	10½	Chelsea, Ordinary	345–350	..	2 18 7
150,000	"	"	5	Do. 5 p.c. Pref.	177–182	..	2 14 11
160,000	"	"	4½	Do. 4½ p. c. Pref. Stk., 1875	160–164	..	2 14 10
175,785	"	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	165–170	..	2 12 11
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	237–242	..	2 17 11
654,740	"	26 June	4½	Do. 4½ p. c. Deb. Stk.	165–170	..	2 12 11
100,000	"	"	3	Do. 3 p. c. Deb. Stk.	105–107	..	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	123–127	..	2 19 0
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	152–157	..	2 10 11
708,000	Stck.	13 Aug.	12	Kent	347–352	..	3 8 3
160,000	"	"	7	Do. New, 7 p. c. max.	220–225	..	3 2 3
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	267–272	..	2 15 2
406,200	100	"	7½	Do. 7½ p. c. max.	227–230	..	3 5 2
350,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	152–157	..	2 10 11
500,000	100	13 Aug.	12⅝	New River, New Shares	433–438	..	2 18 11
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	157–160	..	2 10 0
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	157–162	+2	2 9 4
126,500	100	"	4	Do. Do. 7½ p. c. Max.	150–155	..	2 11 7
489,200	Stck.	"	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 6
1,019,585	"	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	153–156	..	2 11 3
1,155,066	Stck.	12 June	10	West Middlesex	328–333	..	3 0 0
200,000	"	"	4½	Do. 4½ p. c. Deb. Stk.	165–170	..	2 12 11

*Ex div.

† Next dividend will be at this rate.

COAL TRADE REPORTS.

From Our Own Correspondents.

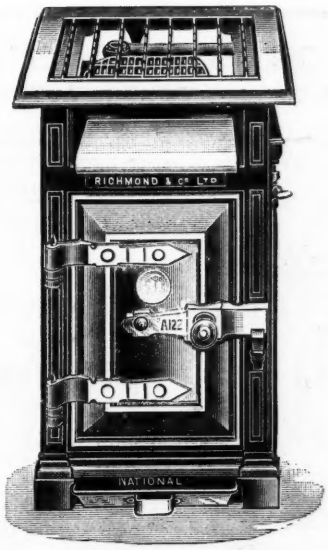
Lancashire Coal Trade.—Now that the holiday stoppages of works in the Lancashire district (which for the past month have very considerably interfered with requirements for all classes of fuel, especially the inferior sorts for engine purposes) are practically over, business is returning to something like its normal condition; while the cold wet weather of the past week is also bringing forward more inquiry for house-fire qualities. Generally, however, the condition of trade remains altogether unsatisfactory. Very few pits are working more than three to four days per week; and prices all through remain on the basis of the lowest summer rates. House coals still meet with but an indifferent demand for the time of the year; and steam and forge coals are also moving off very slowly. Prices at the pit mouth do not average above 9s. 6d. to 10s. per ton for best Wigan Arley; 8s. to 8s. 6d. for Pemberton four-feet and seconds Arley; 6s. 6d. to 7s. for common house coal; and 6s. for steam and forge coals. In engine classes of fuel, supplies have continued rather more plentiful than usual, owing to considerable quantities being thrown on the market on account of the mill and works stoppages in the Oldham and other districts. But except to move off temporary surplus stocks, prices have been pretty well maintained. Common slack averages 3s. to 3s. 6d. per ton at the pit mouth; and better sorts, 4s. 3d. to 4s. 9d. For shipment, business continues slow, and only possible at extremely low rates—7s. to 7s. 3d. being the full average figures obtainable for ordinary steam coal, delivered at the ports on the Mersey.

Northern Coal Trade.—There is a slight falling off in the demand for steam coals; but so far all the chief collieries are able to work full time. Best Northumbrian steam coals are steady at 8s. 3d. per ton, free on board; second-class steam are about 7s. 9d. per ton, free on board; and steam smalls are 3s. 3d. per ton. The shipments are well maintained up to the present time; and there is a heavier demand for locomotive purposes than has been previously known. But some of the shipping houses are drawing near the end of the orders that they have for the Baltic. There is a lull in the manufacturing coal trade; the anticipations of a strike in the engineering works reducing the demand at the present, though the contract quantities are still being taken up. Prices show no great alteration this week. In gas coals, there is an increasing demand; for the production of gas is now enlarging weekly, and some of the great London Companies are beginning freely to stock gas coals. The price quoted is about 6s. 6d. to 6s. 9d. per ton, free on board, for best Durham gas coals; and a local contract, though not officially reported, is believed to have been settled at an equivalent price for land delivery. Coke is firmer; the best blast-furnace qualities being quoted 13s. 6d. per ton, free at the Teesside furnaces; and about 14s. 9d. to 15s. per ton, free on board, for shipping qualities. In one or two cases, there have been concessions in the price of gas coke to exporters; and a larger quantity is now being sent out, while the consumption at some of the large cement manufactories is increasing. Thus, though there is a natural enlargement of the production of gas coke which will continue for four months, the stocks are now being satisfactorily reduced. There is no general alteration in the price.

Scotch Coal Trade.—The coal trade is, in view of possible stoppage, busy in all branches. All classes have a ready market; and prices are a shade firmer. With regard to the demand by the miners for an advance of wages, the position is that, while some of their leaders favour an advance of 1s. per day, a conference of delegates, held in Glasgow, has decided on asking 6d. per day. The men are holding idle days to consider this proposal. The masters, it is thought, will concede the 6d. per day. The prices quoted are: Main, 6s. 3d. (firm); ell, 6s. 9d. to 7s.; splint, 6s. 9d. to 7s.; and steam, 7s. 9d.—all f.o.b., Glasgow. The shipments for the week amounted to 165,328 tons, a decrease of 23,441 tons, when compared with the quantity in the preceding week, and a decrease of 6550 tons when compared with the corresponding week of last year. For the year to date, the total shipments have amounted to 5,033,315 tons—an increase of 231,908 tons upon the quantity in the corresponding period of last year.

Carlisle Gas and Water Works Profits.—The gas profits of the Carlisle Corporation Gas and Water Works in the year ending June 30 amounted to nearly £14,000. From this sum a contribution to the reserve fund of the gas-works will have to be deducted; but there will still remain £13,000 or £13,500 to be paid over to the city fund and the general district fund.

Extensions at the Accrington Gas-Works.—Last Thursday afternoon, the Chairman and members of the Accrington Gas and Water Board, with their Engineer (Mr. C. Harrison) met at the works, Great Harwood, where they inspected the new gasholder that has recently been erected by Messrs. C. and W. Walker, of the Midland Iron-Works, Donnington, Salop. The holder is in three lifts—the outer lift being 119 ft. 6 in. diameter, and each lift 27 ft. 3 in. deep. It is supported by fourteen lattice-work standards, with three tiers of lattice girders and diagonal bracing. The holder and guide-framing are made entirely of steel; and, when full, the holder will contain nearly 900,000 cubic feet. It was constructed to the designs of Mr. Harrison; and the order to proceed was only given to Messrs. Walker at the end of January last. The party was met at the works last Thursday by Mr. Featherstone (Messrs. Walker's General Manager); and, after the holder had been inspected, they adjourned to the Royal Hotel, where light refreshments were served. In the course of the proceedings, the Chairman of the Board said it was a source of great satisfaction, and they congratulated themselves, that they had placed the work in the hands of Messrs. Walker, as it had been carried out in the most expeditious manner, and with the greatest harmony throughout. It was gratifying to know that it had been completed a month before the specified time, without a single hitch or accident; and, on behalf of himself and the Board, he thanked the firm very much for the way in which they had executed the contract. Mr. Harrison emphasized what the Chairman had said; and Mr. Featherstone thanked them for their very kind and gratifying expressions.



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New Water-Works for St. Ives (Cornwall).—The new water-works for St. Ives were formally opened on the 18th ult. A large reservoir has been erected on Hellesveor Moors; and the water is being pumped from St. Ives Consols mine by a Merryweather 7-horse power "Otto" gas-engine, driven by a friction clutch—the consumption of gas being less than 300 cubic feet per hour. The water is raised into the tank at the rate of 6000 gallons per hour. The reservoir, built under the superintendence of the Borough Surveyor (Mr. J. Grenfell) is 70 feet long, 30 feet wide, and 12 feet deep; and it will hold 157,000 gallons. The Mayor (Mr. E. Hain, J.P.) said they had always made the mistake of depending too much on running streams; and when these failed, the water ran short. With a growing population, and a consequent additional consumption of water, the Corporation had to turn their attention to getting a better supply. The present method of pumping the water from the deep levels of the Consols mine had been adopted with good results; and he believed the water question at St. Ives had been satisfactorily settled for very many years to come. The income from the water was now about £300 per annum. It had more than doubled in ten years. Additional buildings were being erected, which meant a large increase in the consumption; but they now had always within their reach an abundant supply of pure water. He then set the pumps in motion, and declared the works open.

The Supply of Water by One District Council to Another.—"It seems strange," the "Local Government Journal" says, "that a sanitary authority who happen to have more water flowing into their reservoirs than will suffice for their own needs should be debarred by the Legislature from disposing of the surplus to a less fortunate neighbour; yet the recent experiences of a District Council in Yorkshire show this to be the case. Being apprehensive of a failure of the water supply in their district, they went to a neighbouring Borough Council for assistance. The latter were both able and willing to afford a supply; but, upon applying for the consent of the central authority, they were reminded that, by the terms of the 61st section of the Public Health Act, they were only empowered to supply water to the authority of an *adjoining* district. In this case, the two sanitary areas did not quite adjoin in the sense that they had a common boundary, because there was a narrow tongue of another district between; and thus a most beneficial proposal was in great danger of falling through. This is only a recent instance of a difficulty which has often been felt in various parts of the country, and more than once District Councils have advocated an alteration of the Act to replace the word 'adjoining' by 'neighbouring.' It is, however, satisfactory to learn that, in the case mentioned, the Council having jurisdiction in the intervening area came to the rescue, and agreed to take the water themselves, though only for the purpose of passing it on to the authority requiring it."

Northfleet and the Purchase of the Gravesend Water-Works.—At a meeting of the Northfleet District Council last Thursday week, a letter was read from the Mayor of Gravesend, in which he expressed the hope that the two governing bodies would work harmoniously for the accomplishment of the purchase of the water-works. Referring to the letter, the Chairman (Mr. Weeks) said a great deal of information was needed before such a purchase was undertaken. It had been mentioned that the sum of £200,000 would be involved; and for small places like Gravesend and Northfleet, this amount was very large. He must speak of the two towns as one in this matter, because he did not know what Northfleet's proportion would be. The money would have to be borrowed, supposing they agreed to the purchase. So long as the Company thought they were in the right, they could refuse to sell; and it was hardly likely they would sell. All the Company had to do was to stick to their Act of Parliament, and snap their fingers at would-be purchasers. On the loan, 3 or 3½ per cent. would have to be paid. The capital of the Company was now £500,000, on which they paid 10 per cent.; but on £200,000 the profit to the towns would only be 2½ per cent. Consequently the present generation would be in a worse position than now, though those who came after would benefit. If Northfleet was served well by the Company, the best thing they could do would be to let them alone; and if Gravesend purchased the undertaking, the Corporation would have to supply Northfleet instead of the Company. In the course of the discussion which ensued, two or three members expressed themselves in favour of the purchase; while the Chairman urged that the ratepayers ought to be consulted.

The Sheffield, Rotherham, and Doncaster Water Scheme.—On the 28th ult., the twenty-fifth anniversary of the incorporation of Rotherham was commemorated by a picnic at the Dukeries; some forty persons accepting the invitation of the Mayor (Mr. E. Hickmott) to be present. The outing wound up with a banquet at the Lion Hotel, Worksop; among the guests being Mr. E. M. Eaton, the Water Engineer of the Sheffield Corporation. To him was entrusted the toast of "The Corporation of Rotherham;" and he naturally took advantage of the opportunity to say something as to the new joint water scheme of Sheffield, Rotherham, and Doncaster, and the position which Barnsley had taken up in connection with it. He said they recognized that Barnsley wanted water; and they proposed to give them a supply, taking over the construction of the works themselves. Had Barnsley thought fit to accede to this suggestion, the ratepayers would have been very much in pocket; but as they elected not to do so, a satisfactory compromise had been made. Barnsley had obtained, at a very large outlay, the water they wanted; and Sheffield, Rotherham, and Doncaster had got the control of the whole of the last remaining watershed in the Don Valley at a very small cost, because they did not have a continuously contested parliamentary fight. Rotherham had secured a supply of water on the best possible terms, because they had obtained it through the agency of a large scheme which would be carried out for less money proportionately than a small one. In the one item of pipe-lines, the water for the three associated towns would be brought down through a main—for a certain distance—of (say) 28 inches in diameter. The water for Barnsley would be conveyed by main for the first few miles alongside the main of the three associated towns, and its diameter might be from 16 to 20 inches. The water for Barnsley, however, could have been conveyed through the main of the three associated towns by simply adding 2 inches to the diameter. This expenditure of capital in the separate main was for no earthly purpose, except that Barnsley wanted to be distinct. Mr. Eaton went on to show the economy of supplying the three towns from one large reservoir, rather than by separate reservoirs; mentioning that they would thus get for 5d. or 6d. per 1000 gallons what would otherwise have cost 7d. or 8d. From the Little Don watershed, they would undoubtedly have water which, as far as organic purity was concerned, was second to none in the kingdom. He thought the three towns might well congratulate themselves on the result of the partnership; and he expressed the hope that they might still further be brought into intimate relationship.

CASES FOR BINDING

VOLUMES OF THE "JOURNAL,"

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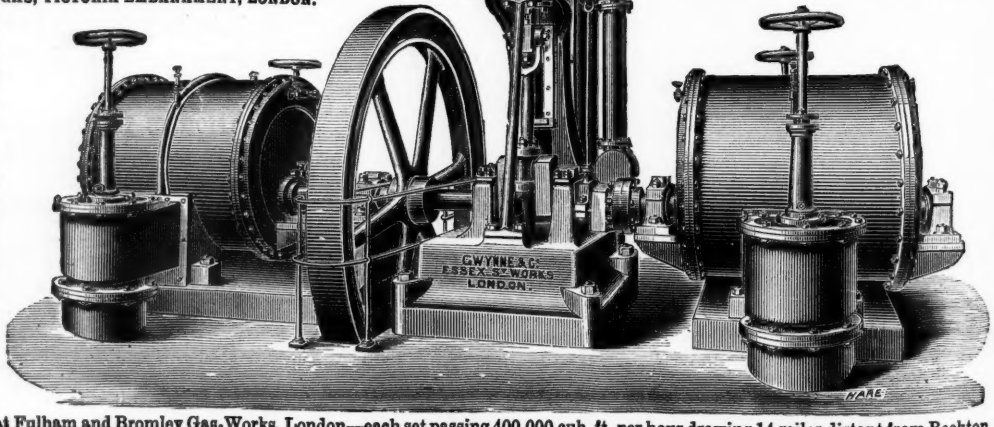

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

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No Tender for less than 10,000 Tons will be considered.

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Tenders, on Office Forms, endorsed "Tender for Coal," should be delivered at my Office not later than the 23rd of September.

The lowest or any tender not necessarily accepted.

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Specific gravity in each case to be stated. The price to include free delivery by rail into elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road.

Probable quantity about 1600 Tons, to be delivered as required during the ensuing Twelve months.

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Offices: Millstone Lane,
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Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
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HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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OUT OF THEIR
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Analysis made by
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Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 „
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Yield of Gas per ton . . . . . 10,500 cub. ft.
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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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Prices and Analysis on application.
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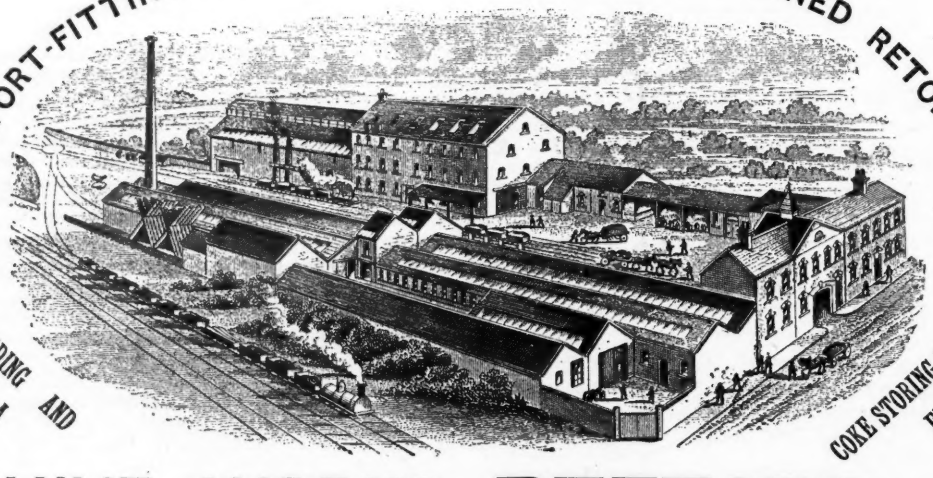

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THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED,

— *v.* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

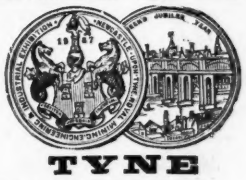
FAITHFULL & OWEN,
11, Victoria Street,
Westminster.

Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.



TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
E. FOSTER & CO.,
12, JOHN STREET, ADELPHI, LONDON W.C.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad St., E.C.

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Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

London: Walter King, 11, Bolt Court, Fleet St., E.C.

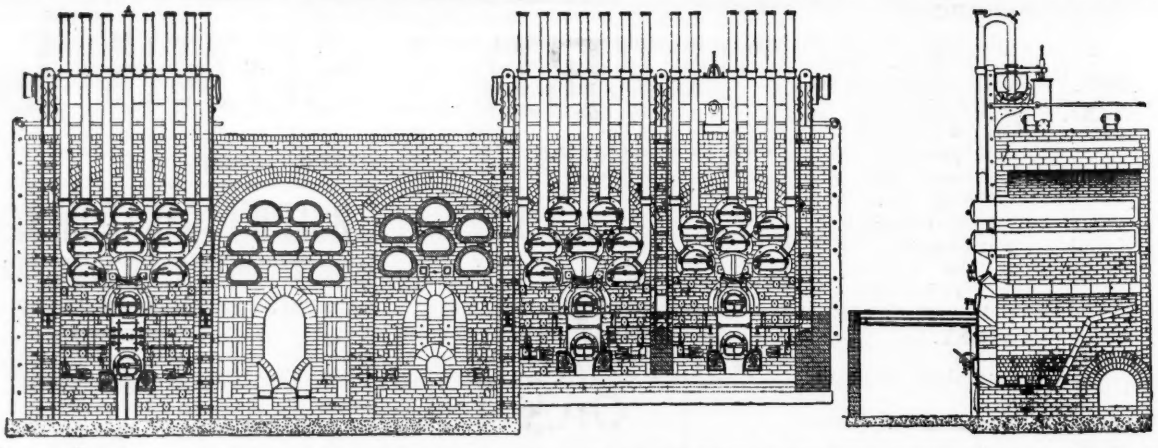
LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, Limited,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

JOHN BROWN & CO., Ltd., Sheffield.
Proprietors of
ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.
VERY FREE FROM IMPURITIES.
TELEGRAMS: "ATLAS, SHEFFIELD."

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 28 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non.*
TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.
The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.
Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.
Further Information and Pamphlets from Principal Agent.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Preston	1,500,000 ,,
Glasgow	300,000 ,,	Southport	750,000 ,,
Brussels	700,000 ,,	Bath	1,000,000 ,,
Liverpool	3,500,000 ,,	New York	1,200,000 ,,
Tottenham	750,000 ,,	Newburgh, N.Y.	350,000 ,,
Santiago	400,000 ,,	Tottenham (Second Contract)	750,000 ,,
Swansea	750,000 ,,	St. Joseph, Mo.	750,000 ,,

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Edinburgh	2,000,000 Cub. Ft.
Shanghai	225,000 ,,	Stockton-on-Tees	500,000 ,,
Winchester	200,000 ,,	Stockport	500,000 ,,
Hoylake	125,000 ,,	Norwich	1,000,000 ,,
Manchester	3,000,000 ,,	Guildford	350,000 ,,
Brussels (Second Contract)	700,000 ,,	Syracuse, N.Y.	850,000 ,,
Holyoke, Mass.	600,000 ,,	Bordentown, N.J.	125,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. — Telegrams: "EPISTOLARY, LONDON." — *United States Office, 64, Broadway, New York.*

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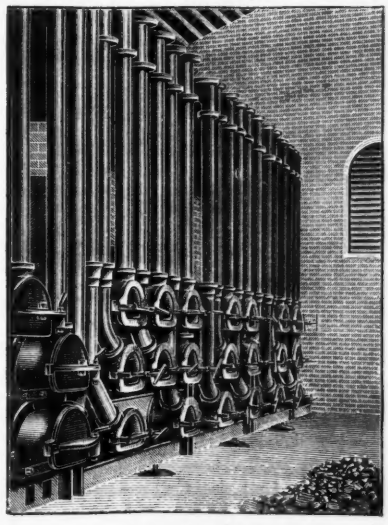
GENERATOR & REGENERATOR FURNACES & SETTINGS

GIVING VERY BEST RESULTS.

LEOMINSTER.

This COMPANY write—

"Mr. Chester's Furnaces and Settings you have erected for us work exceedingly well. Splendid heats under easy control. Nearly 50 per cent. less Coke used for Fuel than formerly. Very convenient for Sunday stopping. Work done in a thorough manner, to our entire satisfaction."



MATLOCK BATH.

Mr. LISTER writes that—

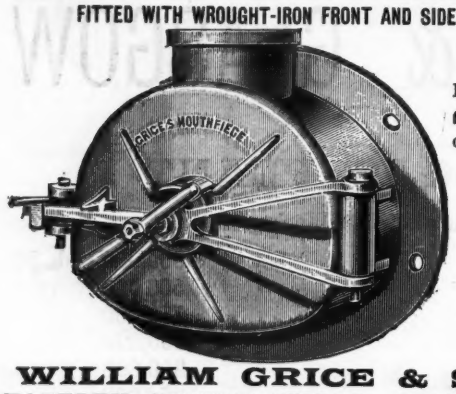
"The result of using Chester's Furnace and Setting for first Six Months of 1896 was to produce 26,000 cubic feet more gas, using 35 tons less coal, and having 171 tons more coke for sale, compared with same period of 1895."

ILLUSTRATION OF Mr. CHESTER'S REGENERATOR FURNACES AND SETTINGS RECENTLY ERECTED BY US AT CLEETHORPES, ABOUT WHICH Mr. BROCKWAY WRITES—

"Can make 8000 to 9000 per mouthpiece easily with **Mr. Chester's Regenerators** you have erected for us. Fuel Consumption much less than with our Generators. Heating of Retorts very even. Very well pleased with working. Results exceed expectations."

GRICE'S SELF-SEALING MOUTHPIECE,

FITTED WITH WROUGHT-IRON FRONT AND SIDE LEVERS.



Patterns for Oval, D, and Rounds, or all sized Retorts.

Catalogue and Price on application.

WILLIAM GRICE & SONS,
FAZELEY STREET WORKS, BIRMINGHAM.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

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PRICE LISTS ON APPLICATION.

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MAKERS OF GASHOLDERS OF EVERY SIZE AND TYPE

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HUNT'S PATENT WASHER. IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS. IT REQUIRES NO MOTIVE POWER

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A SPECIALTY
STEEL TANKS FOR GASHOLDERS AND OIL STORAGE.

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IMPROVED SYSTEM OF CARBURETTED WATER-GAS PLANT PARTICULARS ON APPLICATION.

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CUTLER'S FREEZING PREVENTER IS THE BEST APPLIANCE FOR PREVENTING FORMATION OF ICE IN GASHOLDER CUPS. IT IS IN USE AT MANY IMPORTANT WORKS IN ENGLAND, GERMANY, AUSTRIA, AND AMERICA

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FURNACE BUILDERS.

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- SOLE MAKERS OF -

"SETTLE'S" PATENT COMBINED SEAL-REGULATING FLUSH-VALVE.

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"The Force of the Piston Pump with the Capacity of the Centrifugal combined."

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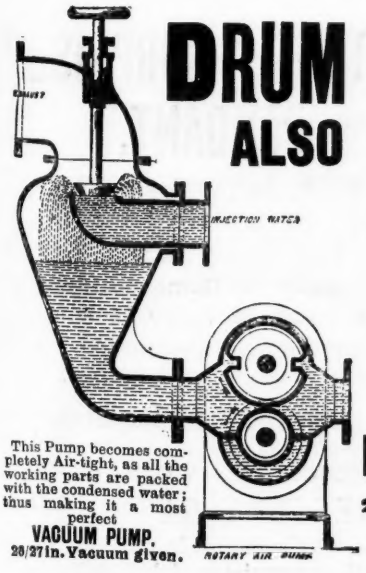
DRUM PUMP AND EXHAUSTER

ALSO VACUUM PUMP AND CONDENSER.



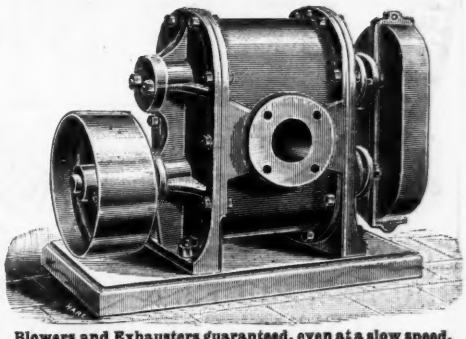
This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect VACUUM PUMP. 26/27in. Vacuum given.

No Priming, Valves, or Frictional Working Parts.

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

DRUM ENGINEERING Co.

27, CHARLES ST., BRADFORD.



Blowers and Exhausters guaranteed, even at a slow speed, to give a working pressure of 2 lbs. and upwards, and this without losing power by creating frictional Heat.

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RETORTS AND FIRE-BRICKS.
BEST QUALITY.

KING BROTHERS, STOURBRIDGE.
(See Illustrated Advertisement, Sept. 1, p. 436.)

BOWENS' Ltd. Successors,
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MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

OXIDE OF IRON.
NATURAL BOG ORE FROM OWN MINES.
Samples and Prices on application.

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Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Sept. 1, p. 437.]

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ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GAS HOLDERS
SPECIALITY
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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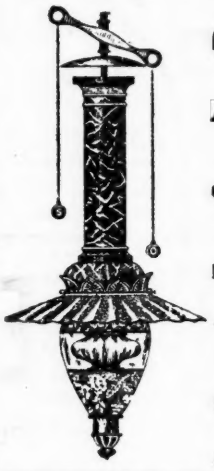
MACHINE-MADE GAS-RETORTS.

THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS,
AND ALL KINDS OF GAS-WORKS APPARATUS.
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of **LYON'S "PATENT" GAS-MAIN SYPHONS.**
AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

The Climax of Regenerative Gas Lighting!!



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A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.

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PARTICULARS AND PRICES FREE. AGENTS WANTED.

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PATENT "SURPRISE" PENDANT,
WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

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it quite **supersedes** the familiar three-light pendant. We are able to bear witness to the **convenience** of the New Pendant."

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IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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ENGINEERS,

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ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
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BEST FIRE-BRICKS, GAS-RETORTS,

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Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

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ESTABLISHED 1836.

JOSEPH CLIFF & SONS,

Incorporated in

THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

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Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

THE PEEBLES PROCESS.

The Oil Gas Enrichment Company's Patents.

This Process for Enriching Coal Gas has now been adopted by nearly **50** Gas-Works at Home and Abroad, and continues to give complete satisfaction.

VERY LARGE PROFITS HAVE ACCRUED AT GAS-WORKS WHERE IT IS IN OPERATION; AND THE TROUBLE ARISING FROM NAPHTHALENE DEPOSITS HAS BEEN REMOVED.

Reference is kindly permitted to the Engineers of the following Gas-Works:

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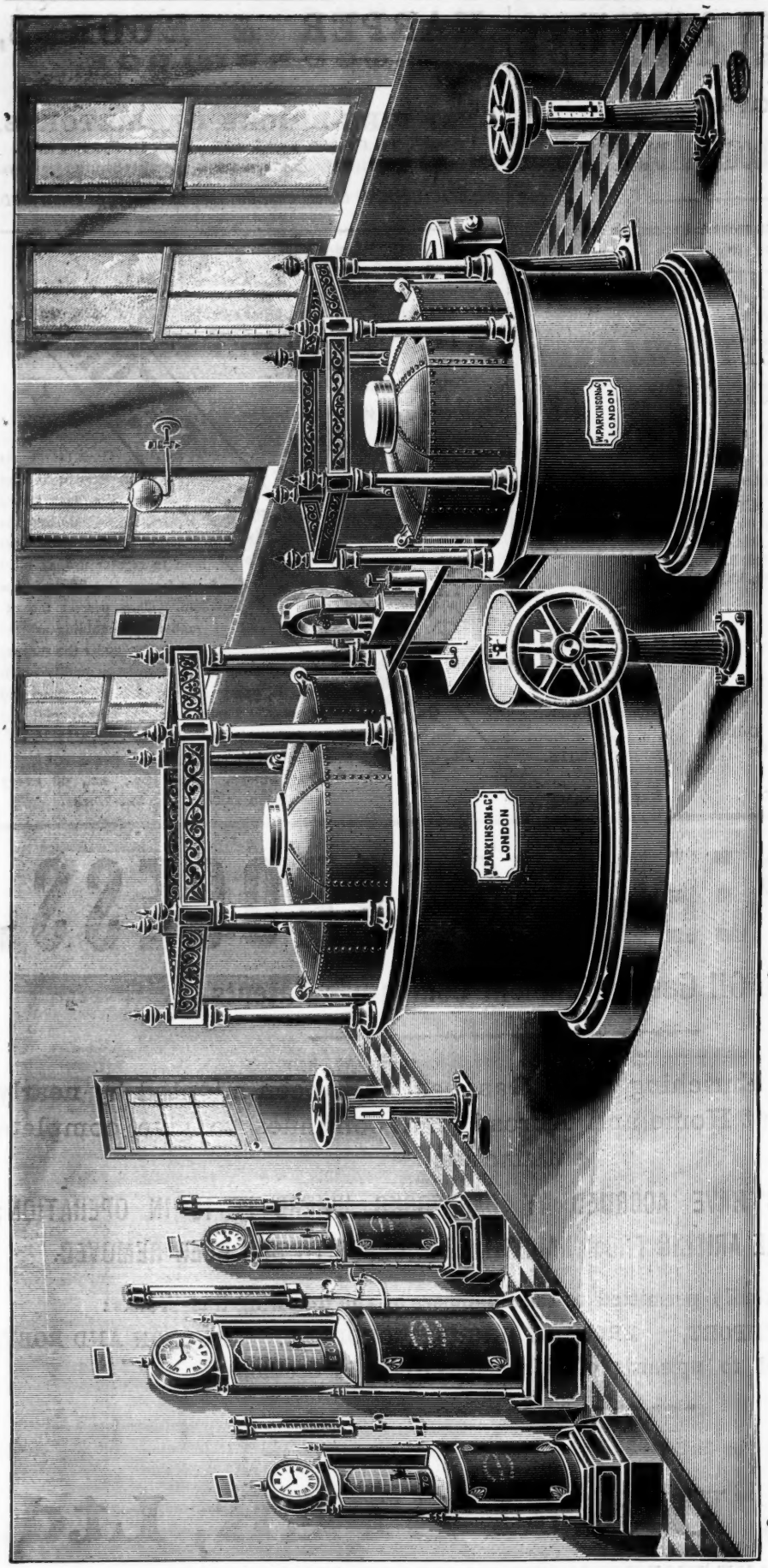
For further Particulars, apply to the Licensees—

R. & J. DEMPSTER, Ltd.

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

*** **Please note that our Advertisements will in future regularly appear in this space—viz., the inside of the last leaf of the JOURNAL—to facilitate reference by our customers.**



EQUILIBRIUM GOVERNORS. THE GASLIGHT AND COKE COMPANY'S VALVE-ROOM, STOKE NEWINGTON.

(TESTIMONIAL.)

THE GASLIGHT AND COKE COMPANY, 146, *Goswell Road, E.C., Jan.* 5, 1893.

GENTLEMEN,—In reply to your inquiry as to the working of the 36-inch and 24-inch Governors (double cone and equilibrium) recently erected by you at the new Valve-Station of this Company, situated at Stoke Newington, I beg to inform you they are highly satisfactory in their working.

The gas governed is supplied through a high-pressure pumping-main; and, notwithstanding the great fluctuations in the initial pressure, owing to so many stations pumping and shutting off alternately, the construction of your Governors enables a perfect equilibrium to be maintained, and being acted upon themselves by outlet pressure only, they stand the most severe test to perfection.

I shall be happy to answer any questions, or show the Governors to Engineers contemplating their erection.

I am, Gentlemen, Yours faithfully,
(Signed) G. F. L. FOULGER, *Distributing Engineer.*

MESSRS. W. PARKINSON AND CO.,
Cottage Lane, City Road, E.C.

W. PARKINSON & CO., LONDON, BIRMINGHAM.

[See also Advt., p. 448.

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